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THE MOLECULAR STATE OF BRASS AND BRONZE ALLOYS.

A Dissertation on the Application of Various Reagents Used to Preserve Homogeneous Structure.

By C. P. Karr.*

If a founder could at any or all times be certain of the molecular state of his castings his success would be measured only by his opportunities. In a sand-mold casting its molecular state is affected chiefly by the temperature at pouring, by the method of melting, by the impurities which enter into the casting, either during the period of fusion, or that arise at the time of the pouring, or that are inherent in the nature and purpose of the casting itself. In this place we are not concerned with the temperature at the time of pouring, nor the method employed in melting down the charge.

By brass we understand a variable composition of copper and zinc with some lead and containing iron either as an ingredient or an impurity. By bronze we understand a metal composition chiefly of copper and tin, containing possibly more or less zinc, lead, manganese, nickel, iron, antimony or arsenic.

In a copper-zinc alloy several expedients have been tried to produce sound castings from impure ingredients, in other words homogeneous castings whose molecular state is practically uniform. Among these expedients may be grouped aluminum, phosphorus, manganese, magnesium, calcuim, silicon, and titanium, which have been tried with more or less success, and last but not least, zinc itself. The starting point in all these applications is the damage done to the molecular state by the ravages of oxidation, and the efforts made to administer the deoxidants in their appropriate media and finally to secure the proper quantity to be used. There is one other consideration not often mentioned and possibly the most important one of all, namely, the nature and usage of the casting itself.

Whatever the type of the furnace may be oxygen is generated more or less freely, and this, as well as the metallic oxides formed at the same moment, are absorbed greedily by the molten metals with which they are in contract. The surface of the fluid metal must be protected from attack by a covering of some kind, either an inert coating, or a flux or a chemical producing a reducing atmosphere or envelope, such as glass, salt and charcoal or other fluxes used separately or together. Before one can choose the reagent best adapted to the purpose he must ascertain the proposed function of the casting itself. Alloys to be converted into molded castings must be treated differently from alloys that are to be put into drawn or rolled work.

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ALUMINUM.

For a cupro-zinc alloy which is to be converted into thin or light castings, or where the metal must be very fluid in the molten state, aluminum is one of the best deoxidizing agents known, provided the casting does not have to undergo a hydraulic test; in such a case it seems to convert the molecules into a globular form so that intimate contact is impossible and therefore not impervious to high pressures, either of water or steam. For other purposes a small excess of aluminum is not injurious. The proper amount to be used is generally from one half of one per cent. up to two per cent. of the amount of copper used in the charge. But for sheet brass or wire, or rolled bars that are to be worked up by stamps, dies, or spun, the use of aluminum as a flux often gives rise to an oxide dross that leaves an ugly mark or streak on flat work, and longitudinal crevices in wire. So great is this difficulty that most mills resort to special devices to plane or shave off the skin of the casting, since these impurities seem to strike to the surface upon the cooling of the mass; this treatment is not always practicable. This dross is generally caused by using the aluminum in excess of its oxidizing capacity. Where aluminum is used as a deoxidizer a slight covering of sal-ammoniac or chloride of zinc is advisable as a flux. By mill men aluminum is considered an injurious ingredient in brass that is to be rolled.

SILICON.

For such work silicon-copper is a better deoxidizer than aluminum, but even to this there is an exception. This reagent exists in the forms of a 10 and a 30 per cent. cupro-silicon, although this classification is sometimes a misnomer. One per cent. of the 10 per cent. silicon and ½ of 1 per cent. of 30 per cent. silicon-copper are generally sufficient. In a copper-tin alloy better results can be obtained if about 2 ounces of phosphor tin (5 per cent. compound) to 4 ounces of 30 per cent. silicon-copper are added to every 200 pounds of copper; in a high-grade steam metal these proportions should be carefully adhered to by weighing out all the quantities. The deoxidizer should be added to the pot just after it has been skimmed, ready to pour, and well stirred in. The general impression has been that when a silicon-copper is used there must be little or no lead present. This impression has been confirmed by S. Tamaru at the Institution for Physical Chemistry at Göttingen (Zts. für Anorg. Chem., v. 61, p. 40), who found that silicon and tin mix in all proportions in the liquid

state and are immiscible in the solid state. The eutectic cannot be distinguished from pure tin either at the melting point or in appearance. Also that silicon and lead or thalium, its sister metal, do not mix either in the liquid or the solid state.

On the other hand where it is found impossible to make up the proposed alloy without using some lead to facilitate machining operations, and where, at the same time, it is desirable to use a silicon-copper deoxidant, it has been found advisable to add some aluminum which seems to exert a calatytic action and prevents the decomposition of the lead. Where silicon is used in bronzes the zinc constituent should also be greatly reduced; for rolled brass not over 0.01 per cent. should be used as a deoxidizer. Manganese does not interfere with its activity. Also note what is stated under the head of titanium. It has been found by Frankel (Zts. f. Anorg. Chem., 58, p. 154-8) that silicon and aluminum form no compound.

PHOSPHORUS.

When first used this element was hailed as a cure-all for every ailment brass and bronze castings were afflicted with, but time and trial have dissipated these views. In a cupro-zinc alloy phosphorus may be introduced either as stick phosphorus (yellow), or as red amorphous phosphorus, or as phosphor-copper, or phosphor-zinc or in a cupro-tin alloy by any one of these or preferably by a phosphor-tin compound (generally 5 per cent. P.) It may be used to advantage in small quantities; an insufficient amount is distitute of any deoxidizing power: an excess produces brittleness and has a tendency to bleach out the copper tint. It cannot be used to correct the evils of an improper melting of the charge, or refine out the dross from the impure scrap used so popularly in the manufacture of ingot brass, as some have supposed. My view of it is that it will eradicate the oxygen generated, and decompose the oxides of copper formed at the moment of fusion or during the melted state, if the proper amount be added and the fluid metal be not overheated.

Phosphor-copper is to be obtained as a 10 per cent. to 15 per cent. of phosphorus and phosphor-tin as a 5 per cent. of phosphorus and phosphor-zinc as a 5 per cent. to 10 per cent. of phosphorus and should be used so that from 3/10 to 6/10 of 1 per cent. of phosphorus be added to the 100 lbs. of copper. It is claimed by some German metallurgists that when a phosphorus compound is used as a deoxidant it forms a thin coating or flux on the molten surface and prevents the liquid from further oxidation. Not over 0.01 per cent. of phosphorus should be present in rolled brass.

MANGANESE.

For the class of alloys under consideration manganese may be used to advantage as a consumer of oxygen, provided the casting is not required to submit to a hydraulic ordeal. This statement is challenged by Sergius Kern, of St. Petersburg (Chem. News, Dec. 4, 1908, p. 273), who avers that a high tension bronze composed of 60 per cent. copper, 38 per cent. zinc, with a little iron and manganese and a little or no tin, may be considered a specialty for liquation process, that it retains its power to resist a hydraulic pressure of even 600 lbs. per square inch. He ascribes the failure of gun metal to meet this pressure to liquation effects. True it is that liquation affects molecular structure adversely. The metal alloy he refers to is really a manganese brass and yet we have found in tests made of such metals carefully compounded that absence of liquation is not a guarantee of immunity from hydraulic failure. For after all the hydraulic test is the supreme evidence of a homogeneous molecular structure.

According to German physicists, an excess of manganese in a copper-tin alloy induces a tendency to split up the original composition and to rearrange the combining constituents, a result that is fatal to a uniform molecular structure. Excess of manganese in rolled brass hardens it and renders the composition dirty. A. H. Cowles advises the addition of aluminum to a manganese bronze. Manganese deoxide at the temperature of molten brass or gun metal is practically an inert metal oxide, unless there be present a chlorate or some other reagent powerful enough to decompose it, and it will not give up its oxygen so as to become an active agent unless there is a strongly reduced atmosphere in the pot. The covering for an manganese brass or bronze should be charcoal.

Manganese brass for rolling should not contain more than 0.05 per cent. of manganese. The proper quantity of cupro-manganese to add is from 5 to 10 per cent. of a 10 per cent. cupro-manganese, but this reagent should be technically free from carbon and iron. The German metallurgists prefer to use not more than 2 per cent. of a 30 per cent. manganese-copper compound.

MAGNESIUM.

Magnesium has been tried as a deoxidizer of copper with more or less variable success. It may be introduced in the form of rod magnesium rather than the ribbon. It is liable to produce drossy castings where used in excess. For brass 2 oz. to the 100 lbs. of copper should not be exceeded; for bronze alloys it has been found advisable to use phosphor tin in connection with the magnesium; one ounce of phosphor tin to 6 ounces of magnesium for every 100 lbs. of copper. If the magnesium is not properly added the results are disappointing, if too little there is no deoxidation, if too much the alloy becomes too brittle or the color is essentially altered, and produces not an enriching but rather a bleaching effect. Temperature of the melt at the time of introduction of cupro- or stanno-magnesium is about 1,000 to 1,100 degs. C.

It has been pointed out by Paul Rakowicz of the Chemische Fabrik Griesheim, Electron of Frankfurt-am-Main, Germany, that as soon as magnesium becomes pasty in a clay or graphite crucible, the crucible should be removed and the magnesium allowed to melt so as to avoid overheating the magnesium, for beyond its melting point it absorbs oxygen and nitrogen. Copper or tin should be added to it in a molten state to form the required deoxidizing mixture. In general for either bronze or brass castings an addition of 0.05 per cent. of magnesium is sufficient; for brass intended for rolling 0.01 per cent. of magnesium should be used. The best form to introduce it would be to prepare a rich magnesium alloy of copper or tin as might be required. For alloys containing nickel a 50 per cent. magnesium-nickel alloy, made as suggested would be a suitable form of introduction.

BI-CARBONATE OF SODIUM.

Bi-carbonate of sodium has been found to be a powerful deoxidizing agent. Its melting point is high and it must be put into the pot with the copper to produce the desired effect. About 3½ oz. per 100 lbs. of copper have been used with good effect.

(To be Continued.)

THE DEVELOPMENT OF THE NAUGATUCK VALLEY BRASS TRADE OUTSIDE OF WATERBURY, CONN.

THE WONDERFUL INDUSTRIAL GROWTH OF A NEW ENGLAND VALLEY.

BY WATERBURY.

In our article on the development of the brass industry in the Naugatuck valley, particularly the city and suburbs of Waterbury, in the January number of THE METAL INDUSTRY, we pointed out how the Yankee spirit of the early settlers in Waterbury took advantage of the fashions and desires of the times and, as this young country began to expand and acquire household utensils, building materials and metallic tools and ornaments, tackled what seemed like insurmountable obstacles, and anxious to reap the profits in store for early inventors, overcame these obstacles and firmly established the brass industries which make Waterbury and Connecticut so prominent in the industrial world today.

GROWTH OF COMPETITION OUTSIDE OF WATERBURY.

It was inevitable that the surrounding country should feel the effect of Waterbury's industrial growth, for although the news traveled less quickly then than now, it was thoroughly circulated and digested and each community was jealous of its neighbor in the matter of making substantial advances. So we see the early settlers in the towns near Waterbury striving hard to keep pace with the little brass burgh and keeping up good records for a time. However, before the civil war most of the industries undertaken outside of the metal industries of Waterbury were tottering, if not already failures.

Somehow the manufacture of woolens and cloths of various kinds were the keenest rival the metal industry had. Curiously enough the first shop of size in the Naugatuck valley, aside from the brass mills started in Waterbury were those of the cloth makers. But the profits from these did not keep pace with the profits from metal goods and one after another the mills failed. In a year or two, occasionally, the ever progressive, conquering brass maker was to be found taking over the abandoned buildings of the cloth manufacturers and starting new plants to turn out brass wares or their by-products. That this process is not yet ended in this State is apparent in the transaction a few weeks ago by which the Coe Brass Company took over the handsome plant of the Warrenton Woolen Mills Company in Daytonville, a section of Torrington, to extend its Torrington facilities. The price paid was $85,000.

It was the plan of the earlier settlers of Torrington, or Wolcottville as it was originally known, to establish cloth mills there and one after another manufacturing companies started, operated successfully for a time, lost business and failed. About the middle of the last century the largest and most substantial of these concerns began to give way and before the civil war the metal manufacturing industries had set their stamp firmly on Wolcottville, now Torrington, and the headquarters of one of the finest brass and copper plants in the world, the property of the American Brass Co.'s subsidiary, the Coe Brass Co.

ORIGIN OF THE BRASS KETTLE.

It was in this little settlement of Torrington that the first brass kettles made by the battery process in America were produced. This was in 1834. Israel Coe of Waterbury was the pioneer who took his fortunes to Wolcottville and with him was associated one of the progenitors of New York aristocracy, Anson G. Phelps, who was one of the foremost importers of copper, brass, machinery and other manufacturing perquisites in the country's early history. It was Mr. Phelps who furnished much of the money in this venture. He was a wealthy New Yorker, having made a fortune in business as a merchant in South Carolina and later as an importer at New York. John Hungerford also was associated with Coe and Phelps.

There was a great demand at the time for the kettles made by the battery process and the business was thriving, but there was a great deal of expense attached to it. It was necessary to import the cast metal from England, as the process of preparing it was not perfected here and this continued until, in 1842, Mr. Coe visited England and learned how John Bull did it. About that time the Waterbury manufacturers were learning the English secrets, and Coe's trip was not a day too early. It was but a short time after he had started casting of brass that Hiram Hayden of Waterbury invented the rolling process and the battery kettles were knocked galley west, although they were far more desirable with a large portion of the trade for years later.

Joint stock company was the refuge of many a group of investors then, as now, and in 1841 the Wolcottville Brass Company was organized with a capital of $56,000, Israel Coe, Anson G. Phelps and John Hungerford each taking one-third interest. Lyman W. Coe was made secretary and treasurer of his father's company and resigned later to become secretary of the Waterbury Brass Company. In 1863 he retired from the Waterbury company and returned to his old love, organizing the Coe Brass Company. The decline in the brass kettle business had been too swift for the young industry and he bought out the $56,000 concern for $40,000, plant and all. With capital of $100,000 the new company started on its triumphant career in the manufacture of brass goods, wire and German silver. Modestly at first, but insistently and steadily, it increased its scope and efficiency and is today a model in modern industries.

DEVELOPMENT OF INDUSTRIES IN VARIOUS CONNECTICUT TOWNS.

This is practically the story of all the present survivors of the mills in old Connecticut towns. They are the result of everlasting grit and perseverance, monuments on the ruins of failures. The Turner & Seymour Manufacturing Company has a history similar to that of the Coe Brass in many respects.

The Excelsior Needle Company is the great example of the value of seizing opportunities. One day a number of sewing machine men from many offices were gathered in Torrington when the cold swaging process of making needles was explained to them and the suggestion made that there was a fortune in it for the men who would build a factory to develop that principle. Cynical incredulity greeted the announcement, wonderful as the demonstration was, but the idea was adopted soon after, and today the plant is turning out millions of needles weekly for the sewing machine manufacturers of the world. The Excelsior Needle Company is one of the best plants of the city and seems always to have plenty of work. One of the leading customers is the Wheeler & Wilson branch of the Singer Manufacturing Company of Bridgeport.

Winsted, the head of the valley, is less of a brass center than Torrington. It has the W. L. Gilbert Clock Company and the New England Pin Company, both over fifty years old and among the principal factory institutions of the valley, but they are its chief metal concerns, aside from a large tool and iron manufacturing plant. Thirty miles from Waterbury, and all up hill, the town is just far

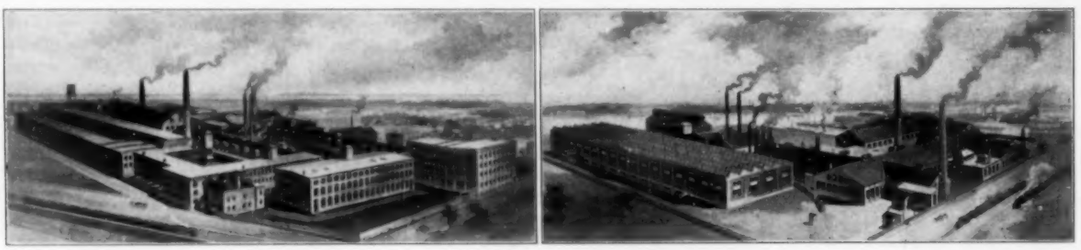
enough away to be the least affected and perhaps the last affected in its direction by Waterbury's influence.

Thomaston, which owes its name and its growth and identity to the persistence of Seth Thomas, that pioneer in the manufacture of great and little clocks, a town nine miles north of Waterbury, has but two big factories. The Seth Thomas Clock Company is the larger, although the dimensions of the Plume & Atwood Company's mills there are not much smaller. The latter is a branch of the Waterbury concern of the same name and is kept busy practically all the time, even in dull seasons, turning out the orders Waterbury cannot handle, or putting raw material in shape for the uses of the Waterbury plant.

Aside from its chemical company, Naugatuck has little affiliation directly with the brass business, and there is a wide gap between the two towns' industries that may never be bridged. Waterbury stands for brass and the nearest neighbor on the south for rubber.

Not until Seymour is reached, over ten miles down the valley, do we find the metals in industrial use, but a glance over the names of the men interested makes it apparent at once that Waterbury's influence is there, if, indeed, not much of her capital. Seymour, Ansonia, Derby and Shelton, the latter three all one industrial community, are towns of small factories, but growing, and of such intricate and interesting character that they themselves furnish a separate study, which will be taken up in the next issue of this magazine.

In passing we may note that in Ansonia is the home of the secondary Coe Brass Company plant, operated under the same name and one of the finest plants in the country. Here, too, is that splendid plant of the Farrel Foundry & Machine Company, the parent of the Waterbury Farrel Foundry & Machine Company, and which sells to the great markets of the world, shipping some of the largest pieces of machinery turned out of any mill to points in all portions of the globe.



MAIN PLANT. BRIDGEPORT BRASS COMPANY. UNION BRANCH.

BRIDGEPORT AS AN INDUSTRIAL CENTER.

Then from these three towns at the junction of the Naugatuck and Housatonic rivers there is a jump of several miles to the Long Island Sound shore. The course follows the combined rivers, however, to Bridgeport, rather than to the larger city of New Haven to the westward and in Bridgeport we find the influence of Waterbury mirrored in what seems almost an endless number of small and larger factories engaged in metal production. Bridgeport is a city of small factories and thriving.

Its leaders for years have been the sewing machine shops, the old Wheeler & Wilson shop, recently made a part of the Singer Manufacturing Company, and the Union Metallic Cartridge Company. These are distinctive and have but little direct connection with the brass industry's rise in the Naugatuck valley. However, it is interesting to note that the inventor of the sewing machine made his first samples in the suburbs of Waterbury. Year after year the machine plants and the cartridge company's plant have grown and today they tower among the industrial monuments of the American nation. Here, too, is a giant in the finishing of brass products begun in Waterbury, the American Tube and Stamping Company. This concern now has a splendidly equipped and manned plant and is a rival of the Waterbury corporations in many respects.

With its fine situation as regards the selling center of the western hemisphere, New York, its water and mill facilities for handling freight, Bridgeport has decided advantages over any inland town and has prospered by them, but it can be safely said that the greatest prosperity has come to it through its development of metal industries. It is curious, but true, that with the great variety of metal shops now scattered throughout Connecticut a large number of the youngest and most promising concerns situated right here in Bridgeport are in the same line, some even making fast headway as producers of specialties.

Both in Derby and Bridgeport, as well as in Waterbury, the International Silver Company has important branches, but the Bridgeport branch is the greatest of the three and its head, George C. Edwards, is justly one of the vice-presidents of the silver company. This concern, popularly known in Bridgeport as the Holmes & Edwards Silverware Company, has a large force—turns out almost everything named in the International Silver Company's catalogues, probably turning out more in bulk than any other branch of the International.

Success marks the metal industries, and particularly those which have been influenced by the remarkably successful Waterbury pioneers. The most striking example is that of the Bridgeport Brass Company, whose head is the son of one of the citizens Waterbury is most proud of, but who is himself a resident of New Haven. Building after building has this growing concern added to its equipment, until today it is foremost in its line in Bridgeport, and with the removal of its New York salesrooms to a handsome new structure in the Park City, recently announced, becomes one of the dominant concerns of the State. But a glance at its directorate is necessary to recognize the Waterbury stamp which has undoubtedly been an important factor in its swift run to the goal of success.

IMPORTANT INDUSTRIAL CONCERNS OF THE VALLEY.

Below are given the important metal industrial concerns in Winsted, Torrington, Thomaston and Bridgeport, with their officers and directors, according to the latest reports recorded, and, in the case of all the larger concerns, the average number of employes and pay-rolls estimated according to reliable information:

WINSTED.

NEW ENGLAND PIN COMPANY, established 1854; organized 1857; capital, $100,000. President Jay E. Spaulding, Winsted; vice-president, James W. Husted, Peekskill, N. Y.; treasurer, Jay E. Spaulding; assistant treasurer, L. L. Chase, Winsted; secretary, George F. Drake, Winsted. Directors: Jay E. Spaulding, James W. Husted, L. W. Tiffany, Winsted; W. P. Curtis, New Haven; George F. Drake, Winsted. All kinds of pins, chiefly hair and common pins; about 250 employees; annual payroll approximately $150,000.

GOODWIN & KINTZ COMPANY, established 1857; capital, $50,000. President, James P. Woodruff, Winsted; treasurer, Winslow Goodwin, Winsted; secretary, Clemens Kintz. Directors: James P. Woodruff, Winslow Goodwin, Clemens Kintz, E. B. Gaylord, Winsted; A. W. Owen, Winsted. Hardware, brass specialities; about 100 employees; annual payroll approximately $60,000.

GILBERT CLOCK COMPANY, established 1871; capital, $500,000. President, James P. Woodruff, Winsted; vice-president and general manager, George B. Owen, Winsted; treasurer, James G. Woodruff; assistant treasurer, Arthur W. Owen, Winsted; assistant secretary, Harvey L. Slausen, Winsted. Directors: J. G. Woodruff, George B. Owen, Lyman R. Norton, of Winsted; B. Frank Marsh, of Winsted; George B. Owens, Jr., of New York. Clocks and clock movements; about 500 employees; annual payroll approximately $300,000.

T. C. RICHARDS HARDWARE COMPANY, established 1874; capital, $100,000. President, T. C. Richards, Winsted; treasurer, T. C. Richards; secretary, C. B. Jenkins, Winsted. Directors: T. C. Richards, C. B. Jenkins. Brass hardware and manufacturers' supplies; about 200 employees. [At present crippled as result of fire.]

TORRINGTON.

COE BRASS COMPANY, organized 1863; incorporated March 25, 1899; capital, $1,250,000. President, Charles F. Brooker, Ansonia; vice-president, James A. Doughty, Torrington; treasurer, Elisha J. Steele, Torrington; secretary, George H. Turner, Torrington. Directors: Charles F. Brooker, James A. Doughty, Elisha J. Steele, A. P. Hine, of Waterbury; James S. Elton, of Waterbury; John P. Elton, of Waterbury. Manufacturers of brass, copper goods, German silver, brass sheets, rolls, plates, tubes, etc.; about 1,800 employees; annual payroll approximately $1,000,000.

TORRINGTON MANUFACTURING COMPANY, established 1885; capital, $120,000. President, James A. Doughty, Torrington; secretary and treasurer, Robert C. Swayze, Torrington. Directors: James A. Doughty, L. G. Turner, of Torrington; G. H. Braman, R. C. Blakeslee, Robert C. Swayze. Special machinery for brass and copper mills.

TURNER & SEYMOUR MANUFACTURING COMPANY, established 1848; capital, $100,000. President L. G. Turner, Torrington; treasurer, E. A. Merriam, Torrington; secretary, Thomas Murray. Directors: Charles F. Brooker, of Ansonia; George D. Workman, of Torrington (deceased); Isaac W. Brooks, of Torrington; Robert C. Swayze, of Torrington; L. G. Turner. Upholstery hardware, gas and electric lamps.

THE STANDARD COMPANY, incorporated 1900; capital, $1,200,000. President, John F. Alvord, Torrington; vice-president, George J. Capewell, Hartford; secretary and treasurer, Bryant S. Keefer, Torrington. Directors: J. F. Alvord, George J. Capewell, George J. Capewell, Jr., of Hartford; Henry S. Skinner, of Springfield, Mass.; B. S. Keefer. Sewing machines, aeroplanes and aeroplane fixtures.

PROGRESSIVE MANUFACTURING COMPANY, incorporated 1905; capital, $100,000. President, J. F. Alvord, Torrington; treasurer and secretary, George E. Hammann, Torrington. Directors: George B. Alvord, of Torrington; John F. Alvord, George E. Hammann. Engines and parts.

EXCELSIOR NEEDLE COMPANY, organized 1870; capital, $1,000,000. President, John F. Alvord, Torrington; treasurer, J. B. Strongman, Boston; secretary, C. B. Vincent, Troy, N. Y.; assistant secretary, J. F. Alvord. Directors: Robert Windsor, of Weston, Mass.; H. H. Skinner, of Springfield, Mass.; E. A. Carter, of Springfield, Mass.; F. E. Snow, of Boston, Mass.; J. F. Alvord. Needles, brass wire products; about 800 hands; annual payroll approximately $400,000.

BRIDGEPORT.

AMERICAN GRAPHOPHONE COMPANY, incorporated 1886; capital, $3,000,000. President, E. D. Easton, New York; secretary and treasurer, E. O. Rockwood, New York; executive officer, H. A. Budlong, Bridgeport; manager of factory, T. H. McDonald, Bridgeport. Manufacturers of graphophones and their parts; 800 to 1,500 employees according to season; annual payroll approximately $750,000.

AMERICAN AND BRITISH MANUFACTURING COMPANY, incorporated 1902. President, George W. Hoadley, New York; vice-president and general manager, Charles L. Gulick, Bridgeport; secretary and treasurer, William M. Gulick, New York. Directors: George W. Hoadley, Alfred H. Hoadley, of Providence, R. I.; William M. Gulick, Charles L. Gulick, William R. Sheldon, of Brooklyn, N. Y. Heavy ordnance, armor plates, etc.; 900 employees; annual payroll approximately $500,000.

ASHCROFT MANUFACTURING COMPANY, incorporated 1886; capital, $200,000. President, C. A. Moore, Greenwich, Conn.; vice-president, John N. Derby, New Rochelle, N. Y.; secretary, C. A. Moore, Jr., Greenwich, Conn.; treasurer, C. M. Chester, Jr., Greenwich, Conn.; assistant treasurer, F. C. Blanchard, Bridgeport. Directors: Charles A. Moore, John N. Derby, C. M. Chester, Jr., F. C. Blanchard, C. A. Moore, Jr. 400 to 600 employees; annual payroll approximately $275,000.

AUTOMATIC MACHINE COMPANY, incorporated 1896. President, Frederick J. Kingsbury, Jr., New Haven; vice-president, James Coulter, Bridgeport; secretary, Stiles E. Goodsell, Bridgeport; treasurer and general manager, Norman Leeds, Bridgeport. Directors: F. J. Kingsbury, Jr., James Coulter, Norman Leeds, Stiles, E. Goodsell, William R. Webster. All kinds of automatic machines. (Affiliated with Bridgeport Brass Company.)

CONSOLIDATED SAFETY VALVE COMPANY, incorporated 1879; capital, $100,000. President, C. A. Moore, Greenwich, Conn.; secretary, C. A. Moore, Jr., Greenwich; treasurer, C. M. Chester, Jr., Greenwich; assistant treasurer, F. C. Blanchard, Bridgeport. Directors: Charles A. Moore, John N. Derby, of New Rochelle, N. Y.; C. M. Chester, Jr., F. C. Blanchard, Charles A. Moore, Jr.

FARIST STEEL COMPANY, capital, $295,000. President, J. Windsor Farist, Bridgeport; secretary and treasurer, George Windsor, Bridgeport. Directors: George Windsor, J. Windsor Farist, Arthur E. Penfield, of Bridgeport.

CRANE VALVE COMPANY. President, F. J. Mulcahy, Bridgeport; treasurer, Roger H. Williams, New York; secretary and general manager, Charles V. Barrington, Bridgeport; vice-president, Richard T. Crane, 3d, Chicago, Ill. Directors: F. J. Mulcahy, R. T. Crane, 3d, Roger H. Williams, F. E. Lally, of Bridgeport; Charles V. Barrington, William E. Allen, of Bridgeport; James M. Wilson, of Bridgeport. All kinds and sizes of valves; average number employees, 2,000; annual payroll approximately $1,250,000.

IVES MANUFACTURING CORPORATION, incorporated 1902; capital, $50,000. President, E. R. Ives, Bridgeport; secretary, Charles H. Silliman, Stratford; treasurer, Harry C. Ives, Bridgeport. Directors: E. R. Ives, Harry C. Ives, James M. Saxton, of Bridgeport; Charles H. Silliman, Theron J. Blakeslee, of New York.

LOCOMOBILE COMPANY OF AMERICA, incorporated 1899; capital, $5,000,000. President, S. T. Davis, Jr., Bridgeport; treasurer, Thomas H. Thomas, Bridgeport; secretary, William H. Delehanty, Bridgeport. Directors: A. L. Riker, of Bridgeport; A. W. Robinson, of Bridgeport; C. W. King, of Bridgeport; S. T. Davis, Jr., William H. Delehanty, Thomas H. Thomas, J. F. Havemeyer, of New York; Evan Hollister, of Buffalo, N. Y.; Franklin D. Locke, of Buffalo, N. Y.; Raymond K. Albright, of Buffalo, N. Y. Locomobiles and their parts; about 1,500 employees; annual payroll approximately $1,000,000.

BRIDGEPORT WIRE GOODS COMPANY, capital $50,000. President and treasurer, T. F. Flandreau, Jr., Chester, N. Y.; secretary, Stuart Beebe, Bridgeport. Directors: T. F. Flandreau, Jr., Stuart Beebe, H. G. Millbank, of Port Chester, N. Y.

AMERICAN TUBE & STAMPING COMPANY, incorporated 1899; capital, $2,800,000. President and treasurer, Frank A. Wilmot, Bridgeport; vice-president, C. D. S. Miller, Bridgeport; assistant treasurer, A. N. Wheeler, Bridgeport; secretary, H. W. Hincks, Bridgeport. Directors: Enoch P. Hincks, of Bridgeport; Schuyler Merritt, of Stamford, Conn.; Charles G. Stamford, of Bridgeport;

Elwood Hendrick, of New York; Charles R. Wimot, of Bridgeport; Frank A. Wilmot, Clarence D. S. Miller, Frank Miller, of Bridgeport; Jesse B. Cornwall, of Bridgeport; Alfred L. Ferguson, of New York; William Coffin, of Pittsburg, Pa. Copper and brass tubing, dies, steel drawn work, drop forgings, electrical goods; about 1,800 employees; annual payroll approximately $1,250,000.

BRYANT ELECTRIC COMPANY, incorporated 1899; capital, $2,500,000. President and treasurer, Waldo C. Bryant, Bridgeport; vice-president, E. M. Herr, Pittsburg, Pa.; secretary, C. A. Terry, New York; assistant secretary and assistant treasurer, John Taylor, Bridgeport. Directors: Waldo C. Bryant, J. W. Hebard, of New York; E. M. Herr, C. B. Hill, of New York, T. W. Siemon, of Pittsburg, Pa.; John Taylor, Charles A. Terry. Electrical goods; 1,200 employees; annual payroll approximately $800,000.

PERKINS ELECTRIC SWITCH COMPANY (affiliated with Bryant Electric Co. and having same officers).

BULLARD MACHINE TOOL COMPANY, incorporated 1894; capital, $500,000. President, E. P. Bullard, Jr., Stratford; vice-president, S. H. Bullard, Newton; secretary and treasurer, A. H. Bullard, Bridgeport. Directors: E. P. Bullard, Jr., S. H. Bullard, D. B. Bullard, of Bridgeport. Machine tools, chiefly steel products; about 700 employees; annual payroll approximately $500,000.

BRIDGEPORT FOUNDRY & MACHINE COMPANY, incorporated 1904; capital, $50,000. President, R. D. Whipple, Bridgeport; vice-president, C. E. A. Thompson, Bridgeport; secretary and treasurer, C. N. Choate. Directors: R. D. Whipple, C. E. A. Thompson, C. N. Choate.

BRIDGEPORT GUN & IMPLEMENT COMPANY, incorporated 1900; capital, $200,000. President, E. Hartley Dodge, New York; secretary and treasurer, H. C. Rylands, Bridgeport. (Now a part of the Union Metallic Cartridge Co.)

BRIDGEPORT METAL GOODS MANUFACTURING COMPANY, incorporated 1909; capital, $50,000. President, Anker S. Lyhne, Bridgeport; vice-president, F. W. Harmon, New York; secretary and treasurer, H. K. Beach, Bridgeport. Directors: Anker S. Lyhne, Frank W. Harmon, H. K. Beach. Metal goods and novelties; 60 employees.

BRIDGEPORT MOTOR COMPANY, incorporated 1900; capital, $100,000. President, F. H. Stillman, New York; vice-president, R. H. Gould, Bridgeport; secretary, H. H. Brautigam, Bridgeport; treasurer, George L. Gillon, New York. Directors: F. H. Stillman, R. H. Gould, G. L. Gillon, H. H. Brautigam. Gasoline engines.

BRIDGEPORT SILVERWARE MANUFACTURING COMPANY, incorporated 1905; capital, $50,000. President, F. H. Macfarlane, Bridgeport; secretary and treasurer, Thomas E. Macfarlane, Bridgeport. Directors: F. H. Macfarlane, T. R. Macfarlane, George R. Burnes, Bridgeport.

BELKNAP MANUFACTURING COMPANY, capital, $30,000. President, William Belknap, Bridgeport; vice-president, C. M. Belknap, Bridgeport; treasurer, W. L. Belknap, Jr., Bridgeport. Directors: W. L. Belknap, C. M. Belknap, W. L. Belknap, Jr.

BRIDGEPORT BRASS COMPANY, capital, $1,000,000. President, Frederick J. Kingsbury, Jr., New Haven; vice-president, George E. Somers, Bridgeport; treasurer, Guy P. Miller, Bridgeport; secretary, W. F. Malloy, Stamford; assistant secretary, Guy P. Miller. Directors: George E. Somers, Charles A. Hamilton, of New York; W. F. Malloy, William R. Webster, of Bridgeport; William F. Curtis, of New York; F. Kingsbury Curtis, of New York; F. J. Kingsbury, Jr. All kinds of brass goods, rolled and sheet brass, tubes, copper products, rivets, wires, etc; about 1,800 employees; annual payroll approximately $1,000,000.

BRIDGEPORT CHAIN COMPANY, incorporated 1887; capital, $260,000. President, George C. Edwards, Bridgeport; treasurer, George S. Bryan, Bridgeport; secretary, George H. Edwards, Bridgeport. Directors: George C. Edwards, George S. Bryan, George H. Edwards, George E. Judd, of Waterbury. Steel wire, flat metals and specialties.

BRIDGEPORT CRUCIBLE COMPANY, incorporated 1887; capital, $100,000. President, George E. Somers, Bridgeport; secretary, W. A. Macfarlane, Bridgeport; treasurer and general manager, W. T. Macfarlane, Warwick, R. I. Directors: George E. Somers, William T. Macfarlane, W. E. Burnham, of Bridgeport; Charles N. K. King, of Jersey City, N. J. Crucibles for metal mills. (Affiliated with Dixon works of Jersey City, N. J.)

BRIDGEPORT DEOXIDIZED BRONZE & METAL COMPANY, incorporated 1892; capital, $75,000. President, R. D. Whipple, Bridgeport; vice-president, C. E. A. Thompson, Bridgeport; secretary, treasurer and general manager, C. N. Choate, Bridgeport. Directors: R. D. Whipple, C. L. Whipple, C. N. Choate, I. M. Choate, C. E. A. Thompson, K. K. McLaren, of Jersey City, N. J. Bronze founders.

BRIDGEPORT FORGE COMPANY, capital, $200,000. President and treasurer, Charles F. Bliss, Ansonia; secretary, Thomas Hallen, Bridgeport. Directors: Franklin Farrel, of Ansonia; Alton Farrel, of Ansonia; Charles F. Bliss, William F. Fulton, of Waterbury; Thomas Hallen. (This plant is idle at the present time owing to a recent fire. It will probably resume after the insurance claims are adjusted.)

SINGER MANUFACTURING COMPANY, capital $30,000,000. President, Douglas Alexander, Stamford; vice-president, Edwin H. Bennett, Bayonne, N. J.; treasurer and assistant secretary, Oscar R. Graham, Elizabeth, N. J.; assistant treasurer; A. K. Bourne, Oakdale, N. Y.; secretary, T. E. Hardenbergh, New York. Directors: Douglas Alexander, F. G. Bourne, Edwin H. Bennett, T. E. Hardenbergh, Stephen C. Clark, of New York; A. K. Bourne. Sewing machines, rotary shuttle movements, etc.; 1,500 employees; annual payroll approximately $750,000.

WOLVERINE MOTOR WORKS. President and treasurer, Charles L. Snyder, Stratford; vice-president, M. T. Snyder, New Orleans, La.; secretary, L. J. Snyder, Stratford. Directors: Charles L. Snyder, M. T. Snyder, L. J. Snyder. Marine motors; 150 employees; annual payroll approximately $100,000

BURNS & BASSICK COMPANY. President, Samuel A. Burns, Bridgeport; vice-president, Edgar W. Bassick, Bridgeport; secretary and treasurer, Wilbur F. Burns, Bridgeport. Directors: Samuel S. Burns, Edgar W. Bassick, Wilbur F. Burns. Railroad hardware, cabinet hardware; 300 employees; annual payroll approximately $180,000.

WARNER BROS. COMPANY. President, I. DeVer Warner, Bridgeport; vice-president, Lucien X. C. Warner, Bridgeport; New York; treasurer, DeVer H. Warner, Bridgeport; secretary, Lucien T. Warner, Bridgeport. Directors: I. DeVer Warner, Lucien X. C. Warner, DeVer H. Warner, Lucien T. Warner, Harry F. Greenman, of Bridgeport. Steels, buckles, hose supporters, clasps and other metal goods for corsets; 350 steel and metal workers; annual payroll approximately $200,000.

WHITE MANUFACTURING COMPANY. President, Thomas Boudren, Bridgeport; treasurer and secretary, Horace S. Wilmot, Bridgeport; assistant treasurer and assistant secretary, S. M. Middlebrook, Bridgeport. Directors: Thomas Boudren, H. S. Wilmot, Enoch P. Hincks, of Bridgeport; George H. Johnson, of Bridgeport; S. M. Middlebrook. Lamps, coach lamps and automobile mountings.

CURTIS & CURTIS COMPANY. President and treasurer, Lewis B. Curtis, Bridgeport; vice-president and secretary, A. M. B. Curtis, Bridgeport. Directors: Lewis B. Curtis, A. M. B. Curtis, S. F. Beardsley, of Bridgeport. Pipe machinery, turning machines, etc.

HOLMES & EDWARDS SILVER COMPANY (Factory C, International Silver Company). President, George C. Edwards, Bridgeport; treasurer, George C. Edwards; secretary, James G. Ludlow, Bridgeport. Directors: George C. Edwards, M. Bannard, of New York; Walter Jennings, of New York; Oliver Jennings, of New York; Morris W. Seymour, of Bridgeport; James G. Ludlow, of Bridgeport. All kinds of silverware; 1,200 employees; annual payroll approximately $750,000.

UNION METALLIC CARTRIDGE COMPANY. President, William J. Bruff, Brooklyn, N. Y.; vice-president, M. Hartley Dodge, New York; secretary and treasurer, George W. Jenkins, New York; second vice-president, Jerome Orcutt, Bridgeport; assistant secretary, James M. Gaines, Bronxville, N. Y. Directors: M. Hartley Dodge, George W. Jenkins, George W. Hebard, of Brooklyn, N. Y.; W. J. Bruff, Jerome Orcutt. 1,700 employees; annual payroll approximately $1,000,000.

THE MANUFACTURE OF WROUGHT BRASS.

A Description of Modern Methods for the Production of Plate, Sheet, Rod, Wire and Tube.

(Continued from January.)

By L. J. Krom.

LEADED MIXTURES.

The next leaded mixture on the list is clock or wheel brass, printers' rule, etc. This metal consists of copper 64-65, spelter 33 to 34 and lead 1½ to 2 parts, and is used for a multitude of purposes, the principal one being in the manufacture of cheap clocks, all of the wheels and frames being stamped from it. It has a good yellow color and is very easy to work, cuts sharp and clean on the edge and is fairly strong. A leaded mixture running still higher in copper and lead is known as screen plate mixture and is used extensively for the manufacture of screen plates used in paper making. The plate must withstand not only considerable pressure as the pulp is squeezed through it, but also the action of the sulphite waters and other corroding liquids. The mixture is copper 66 to 68, spelter 29 to 32 and lead 2 to 3 parts. Another use to which this metal is put is for the manufacture of reeds for organs, for which purpose this particular mixture is admirably adapted. The above completes the list of leaded mixtures used for sheet metal, with the exception of some special ones made according to some customers' specifications.

FIG. 1. VIEW OF INTERIOR OF A MODERN BRASS CASTING SHOP.

BRASS MIXTURES CONTAINING TIN.

As has been remarked before, it is general practice in the brass business to call mixtures of copper and spelter containing small amounts of tin, bronzes. This is of course wrong and "local tradition" can be given as the main reason, while a more modern one is the desire on the part of the manufacturer to hoodwink the unwary into thinking he is getting something unusual in the way of a metal at a low price. A mixture in common use containing a low copper content and a small percentage of tin is included under the heading of "Rolled Bronze" in the United States Government specifications for the inspection of material for the Bureau of Steam Engineering now in force. This mixture, which is called "naval brass" when cast in sand, consists of copper 61 to 63, spelter 34.5 to 38 and tin 1 to 1.5 parts.

In the brass mills when this mixture runs from 59 to 61 parts of copper with from .75 to 1.5 parts of tin, it is known as "Tobin bronze." With a higher content of copper, say 63 or 64 parts and generally 1 part tin, it becomes in sheet form, "spring brass" and "pin wire" when cast in rod shape. The mixtures containing tin and a higher content of copper than 63 or 64 are many and varied, they are usually made to order and are not carried in stock by many mills without a continued demand for some particular one. For a list and description of such mixtures the reader is referred to published books on metal mixtures.*

Brass mixtures containing both tin and lead are also included in the special mixture class and are used only to fulfil some particular office. Their number is limited chiefly because of difficulty in casting and rolling. The principal mixture of this class now in use is known as "rich leaded bronze" and is used almost entirely in rod form. It consists of from 85 to 88 parts copper, .5 to 1.5 parts of tin, .75 to 1.5 parts of lead and the balance spelter. This metal is used in large quantities in builders' hardware. It is fairly strong, has a rich reddish gold color, takes a fine polish, is readily worked under certain conditions and is good metal to machine—turn, drill, etc. It is a very difficult metal to cast properly and to handle in the mill. Some of the precautions necessary will be taken up when a description of casting operations is given.

Having now enumerated most of the mixtures in common use it is in order to begin a description of the actual mixing of the metals and the successful pro-

*Mixed Metals, A. H. Hiorns. Metallic Alloys, W. T. Brannt, etc.

duction of the various kinds of wrought brass. Perhaps the first thing of interest in the making of brass is the manner in which the mixtures are made up.

HOW TO FIGURE THE MIXTURES.

Modern methods for making mixtures in the brass casting shop are based on existence of a laboratory and a chemist. All the materials purchased in the raw state are carefully analyzed, and the state of purity known, all the scrap returned from the mill and also that brought in from outside sources is tested and classified according to its mixture. This precludes any guess work, and the brass mill chemist can count with reasonable certainty upon his mixtures resulting as calculated. Moreover, these methods reduce scrap to a minimum, for no more metal is made than is necessary to fill an order, by reason of the fact that the calculated mixture will not have to be recast because the caster got a "little too much copper in it in trying to match the color of his sample"!

When the mixture to be delivered to the mill is to be made of new material and there is plenty of scrap on hand of the same mixture the problem is easy, but when there is a large amount of scrap consisting of a higher copper content than the mixture desired, then the chemist comes into prominence and he makes the mixture. Suppose the shop has an order for so many pounds of a mixture of copper 68, spelter 32 and all the scrap he has is 70 copper and 30 spelter. The size of the pot determines the amount of charge; suppose it is 200 lbs., then 136 pounds of copper are required for each pot. Now allowing for the loss in melting, generally figured at 1½ per cent.—this amount is added to the amount of spelter required or 3 lbs. (the loss is figured as being due to spelter entirely), hence 203 lbs. of metal are required. The next thing to determine is how much scrap can be used; in ordinary practice this may be taken as 25 per cent., though of course this varies with the mill, then we have 200×25 per cent.—50 lbs. of scrap which will furnish 35 lbs. of copper, the chemist adds then 101 lbs. of copper and his caster's ticket would read as follows:

Weigh 101 lbs. of copper
52 " " spelter
50 " " scrap (70-30) or marked (—).

This, of course, is one of the simplest problems that confront the chemist, but his experience will soon teach him that it is a simple matter to figure any mixture put before him, and good judgment will bring results and very frequently he will be called upon to make a mixture that has to be made up while the metal is in the fire. In the old days of darkness, if a caster's helper got two charges of spelter or lead into one pot the metal was at once condemned as scrap or allowed to "go through" unchecked and caused a great amount of trouble all along the line. Now the chemist, when apprized of the difficulty, simply adds more copper, etc., and completes the mixture while still melted into a live mixture, and no harm is done other than to make that order one pot short, which is easily made up. The writer remembers a case where a caster in making extruded metal billets, added too much copper, the mixture should have been copper 62, spelter 36 and lead 2 parts, he had weighed out 66 lbs. of copper per hundred of mixture. The chemist was notified and knowing that a billet carrying this amount of copper would probably break the extruding machine, he simply changed the scrap to be added and increasing the amount of lead, converted the "round" into "screen plate" mixture of 67 copper, 30 spelter and 3 parts of lead, and the extruding machine was saved.

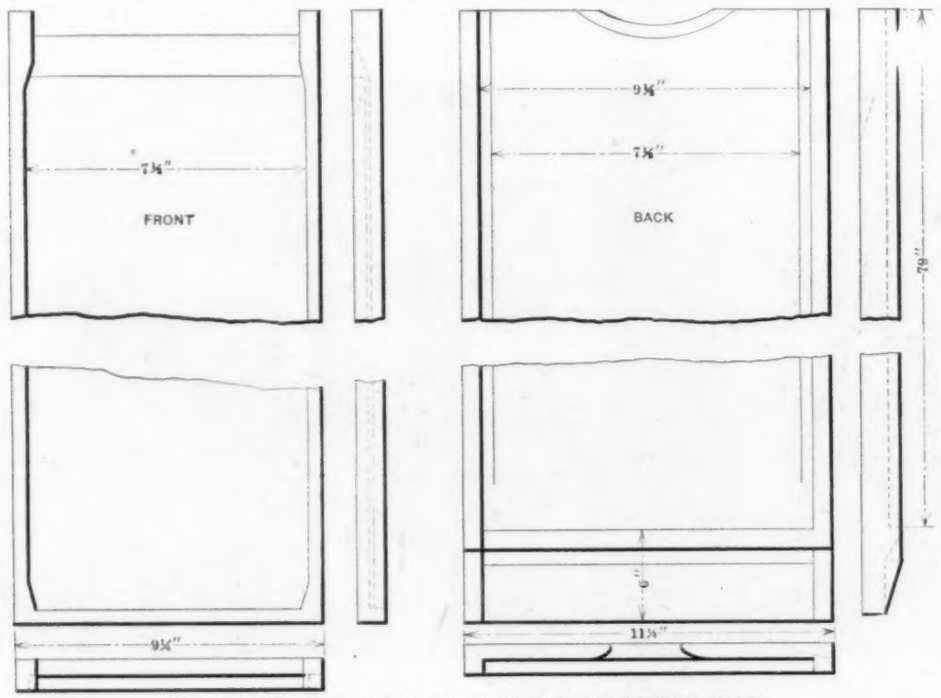


FIG. 2. SKETCH OF IRON MOULD USED FOR WROUGHT BRASS.

Again, suppose an order calls for "naval rod mixture"—62 copper, 36½ spelter and 1½ tin, and the only scrap available is some low brass running upon analysis 85 copper, 14 spelter and 1 of tin. He is required by the rule of the mill to run 100 lbs. of new stock and balance per pot scrap. Here we have in a 200-lb. charge 124 lbs. of copper required and 3 lbs. of tin. In the 100 lbs. of low brass he gets 85 lbs.

of copper and 1 lb. of tin. He makes the regular 1½ per cent. allowance for loss in spelter, but in this case on the new stock alone, and his ticket will read:

Weigh	39	lbs.	copper
	60½	"	spelter
	2	"	tin
	100	"	low brass scrap mark —

In these instances it is noted that the scrap must be weighed in order to preserve the mixture. When, however, the same scrap is used as the resulting metal will be, it is not necessary to weigh the scrap, and most tickets read, "Fill pot with scrap marked (—)."

THE CASTING SHOP.

It is not within the province of this article to describe at great length the "lay out" of a casting shop. It will only be necessary to state that the fires in general use today are of the pit furnace type, with the top plate raised about 4 ins. from the floor. This is done principally to allow of a pig of copper or piece of spelter lying by the fire to be grasped readily by the tongs as its end projects over the edge of furnace top. This is particularly advantageous in winter when the spelter charges are put on the "hob" in order to thoroughly dry out the frost that may be in the metal, as it is generally stored where exposed to the cold.

The cut, Fig. 1, shows the interior of a modern casting shop, and it will be seen that the fires are built in rows. As a general rule, from 10 to 12 fires are built in one set or section. Some casting shops have upwards of 300 such pit furnaces. These are built in straight rows and sometimes in a circle round a chimney or stack, this latter form is, however, becoming obsolete and modern practice demands that they be built in straight rows, and better through the center of a shop which allows of mould racks and pits on each side, leaving the walls free to set the weighing benches where good light will be afforded for the weighing out of charges. Another very important feature of this arrangement is that with the proper manipulation of the windows on both sides, the gases and spelter fumes will be carried up to the ventilators in the roof and thus free the shop from the dense fog so often seen in the old-time shops.

The chimneys on the modern shops are gigantic, rising in some cases to a height of 160 feet and affording natural draught for 80 fires, thus requiring two only for an installation of 160 fires. The capacity of such a shop is enormous when one considers that every pound of metal turned out is handled at least six times. Each set of 10 fires is capable of producing, using a No. 70 crucible, 10,000 lbs. of metal. In a day's work, the whole shop then on a day shift could turn out 160,000 lbs., and if, as is sometimes the case, the shop is run day and night, the remarkable total of 320,000 lbs. of net weight or metal delivered to the mill per 24 hours is possible. This means that 1,920,000 lbs. of metal must be handled every day of 24 hours by a shop of such capacity, and there are several such now in operation.

Wrought brass is cast in iron moulds made of soft cast iron in two parts called the front and back. (See Fig. 2.) The back is made heavier than the front. The mould is either leaned against a rack set on the floor or placed in a pit. Up-to-date practice demands a pit, for the moulds are made large enough to hold over 200 lbs. of metal, including the gate or riser which is cast on to allow for shrinkage and dross that may rise to the top. This gate is afterwards cut off by means of what are called alligator shears, by reason of their business or cutting end resembling the mouth of an alligator. Such a shear is shown in Fig. 3, and is capable of cutting up to 4 ins. of cold steel.

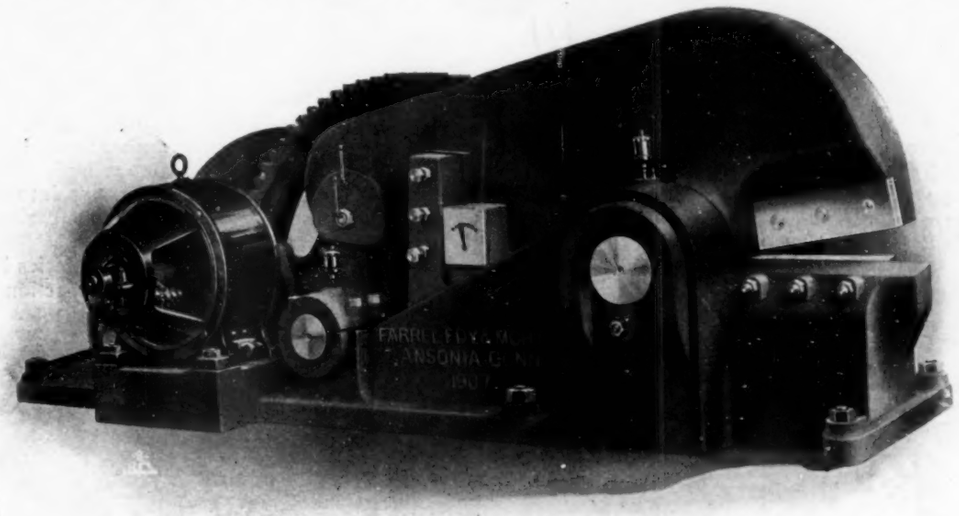


FIG. 3. MOTOR DRIVEN 10-IN. ALLIGATOR SHEAR USED IN BRASS MILLS

The moulds are made with a slight depression or belly so that the resulting bar of brass has a corresponding rise or swell. This is unusually ⅛ inch at the center of the bar. This swell is put on in order to insure that no dirt or dross will settle on the center of the bar and also to allow of a greater reduction in the first rolling without cracking out on the edges, which is claimed takes place if the bar is cast flat.

(To be Continued.)

PRACTICAL ELECTRO-DEPOSITION OF GOLD.

An Exhaustive Treatise on the So-called Rose, Roman, Green Gold and Siamese Finishes, to Be Continued for Several Issues.

By August Hoffman.*

THE GENERAL APPARATUS AND CHEMICALS NEEDED FOR ELECTRO-GILDING.

AUGUST HOFFMAN.

To do good work in this line, it is necessary to have in operation a sand blasting machine, which is nothing more than a funnel which contains sand of a fine texture (thoroughly dry sea sand is best) arranged in a convenient place, having a ⅜ in. gas pipe connected to the lower end or spout of funnel, to which is attached a pipe leading from the pressure blower, in such a manner that as the sand drops through the pipe from the funnel, the air from the blower will force the sand down through the pipe attached to the funnel and fall again into a box arranged to catch the sand as it blows out. A good plan is to build this on an enclosed wooden frame, and care must be taken so as not to make the pipe longer than is convenient to work with. (See Fig. 1.) At the present time there are sand blasting machines on the market which can be purchased from any supply house.

It is necessary to have a high-speed taper spindle lathe, making about 3,500 revolutions per minute, a 2-row brass scratch-brush on one end and a 1-row brass scratch-brush on the other, both of about 2 ins. in diameter and

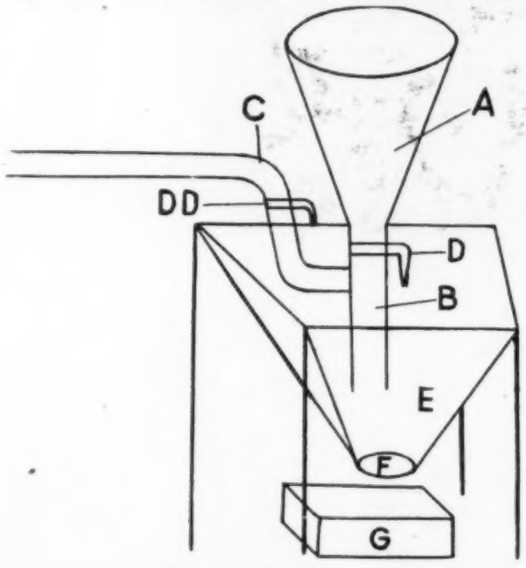


FIG. 1. SAND BLAST OUTFIT.

under each brush a pan containing water saturated with Panama soap bark. These brushes will be found suitable for all classes of jewelry work. (See Fig. 2.)

THE BATTERIES OR DYNAMO.

The next thing required is a series of batteries or a small dynamo, to give the electric current needed for the deposition of the gold. If the operator desires to use the batteries, I have found the Bunsen battery, of 1 gallon capacity, to be the best, and three of them will give sufficient current to do almost all kinds of gold plating, as these in a series will give about 4½ volts. These batteries can be obtained at any supply house and consist of a glass jar, a zinc shape to fit inside of jar, a porous cup to fit inside of zinc and a carbon plate, which is placed into the porous cup, the zinc and carbon having brass connections to which the operator attaches his wires. It is best to place these batteries on a small platform under the bench on which the gilding is to be done and then run the wires up from behind, to the top of the bench.

To put the batteries in working order proceed as follows: Clean all the parts, the jar, zinc cup, and carbon, with clean water and then fill glass jar about ⅔ full with clean cold water; now add a little nitric acid, 1 ounce to a gallon of water. Then take a 5-gallon earthen jar and after cleansing thoroughly, place into it 2 pounds of bichromate of potassium and 2 gallons of clean water; nof stir until dissolved, then add 1 quart of sulphuric acid a little at a time and very slowly, as this causes heat and the solution will become quite warm. Allow to cool, and then pour into the clean porous cup of the battery, making it about ⅔ full, and use a small porcelain dish or glass during the operation. Now place the glass jars containing the water and nitric acid on the aforesaid platform, then place the zinc into the jar, and the porous cup within the zinc and the carbon plate into the porous cup and electropion solution.

You then proceed to convert your batteries into a series, by placing a copper wire from the connection on the car-

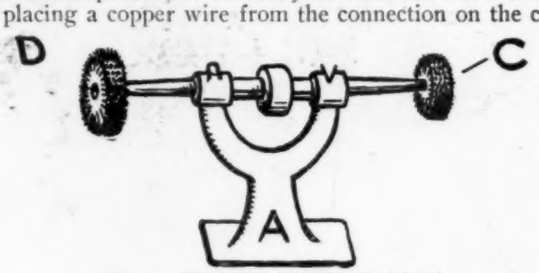


FIG. 2. SCRATCH BRUSH MACHINE.

bon of battery No. 1 to the connection on the zinc of No. 2, from the carbon of No. 2, to the zinc of No. 3, as shown in Fig. 3. Then run a wire from the zinc connection of No. 1 to the top of the bench, which is the

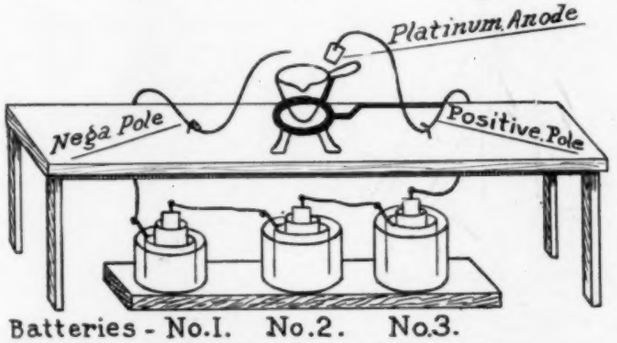


FIG. 3. BATTERIES USED FOR CURRENT.

negative pole or cathode and one from the carbon of No. 3, which is the positive pole, to the end of which is attached a piece of platinum about ½ inch wide and 2 inches long of any thickness, which is called "The Anode."

Batteries set up in this manner with good care will

*Foreman Plater, J. S. Osborne Company, Newark, N. J.

last a long time and give good results, but I do not advise the use of them, as they take considerable time to clean and put in order when they run out; also, because they are the old style of obtaining current, and to be up to date a dynamo is necessary, which, when once installed lasts a long time and gives a more uniform and even current with little attention and care. Therefore, if a dynamo is desired any supply house can install one and the wires can be run along the wall to the desired spot in the same manner, viz.: the negative pole or cathode wire must be convenient to the left hand of the operator and the positive pole should be for the right hand.

Next we come to the utensils, etc., which consist of 3 or 4 one quart porcelain dishes which must be of a high grade, as they are subjected to a direct heat of the gas flame; 5 or 6 china bowls, ½ dozen ½-gallon bottles with

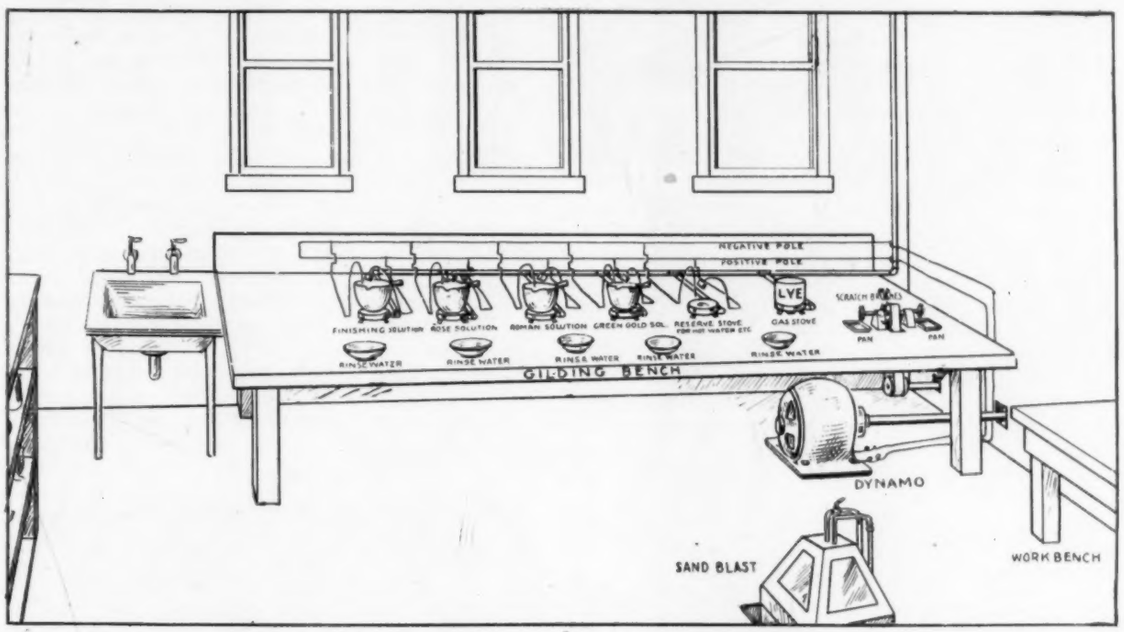


FIG. 4. GENERAL ARRANGEMENT OF JEWELRY PLATING ROOM.

a large neck and opening; 1 graduate or measuring glass, 1 glass funnel, retort stand and filter papers for same and a few one-flame gas stoves, one of which is placed on the gilding bench between the two poles leading from the batteries or dynamo, having the negative pole on the left and the positive on the right, as shown in Fig. 3.

It now becomes necessary to get a supply of chemicals and gold when all will be ready to start the gilding process. The chemicals needed are as follows: nitric acid, sulphuric acid, muriatic acid, aqua ammonia, c. p. cyanide of potassium, ferro-cyanide of potassium, c. p. ammonium chloride, bi-sulphite of soda, caustic potash, carbonate of copper, white arsenic, lye, bicarbonate of soda, nitrate of silver, carbonate of soda, and now having installed all things necessary we will proceed to our next chapter and begin to arrange our plant in up-to-date style.

GENERAL ARRANGEMENT OF PLANT SUITABLE FOR MANUFACTURING JEWELERS IN UP-TO-DATE STYLE.

It now becomes necessary to place our paraphernalia in such a manner as to be most convenient for the operator, and the first thing is to select a part of the workshop where he can have the benefit of good light and be near running water. (See sketch, Fig. 4.) Secondly, a strong work bench of 2-in. planking should be built about 3 ft. high, and directly in front of the windows, if possible, and as long as space will allow so as to give plenty of room. If a dynamo is used it is generally placed on one end of this bench or on the floor under it, and the wires (negative and positive) run along the back of it and where batteries are desired, placed on a platform under the bench as stated above.

The sand-blast machine may be placed in any convenient part of the shop, as it is an operation by itself, though it is best to have it set up as near the gilding room as possible. It may be well to state that considerable sand dust flies from this machine while working, and therefore it should not be placed where it would injure other machinery or throw dust into the solutions, etc.

A gas connection must be set on the gilding bench for two or more stoves, as desired. One-flame gas stoves are best to use. The current wires should be placed as shown, and an ordinary one-gallon agateware pot placed on one of the stoves, filled with clean water, into which is thrown one pound of lye. The taper spindle lathe should be placed on the same end of the bench as the dynamo, if used, with the scratch brushes on each end; and, now, having all in working order, we will take up the "first steps in the art of electro-gilding."

(To be Continued.)

NEW PROCESS OF GALVANIZING.

A new process of galvanizing, resembling sherardizing, has been patented (United States patent No. 928398). The iron or steel to be galvanized is coated with a paste composed as follows:

	Parts.
Zinc flue dust	88
Lampblack	2
Clay	10

The ingredients are mixed with water and applied to the cleaned iron or steel surface. The whole is placed in a furnace and heated to a temperature, the inventors say, of from 600 degs. to 1,000 degs. Fahr. This heating is continued from a half to four hours.

THE DETROIT CONVENTION OF FOUNDRYMEN AND MANUFACTURERS.

AN ENTHUSIASTIC FORECAST OF THIS IMPORTANT EVENT.

BY OUR DETROIT CORRESPONDENT.

The American Foundrymen's Association, with its allied trade organizations, the American Brass Founders' Association, the Associated Foundry Foremen and the Foundry and Manufacturers' Supply Association, will open their fourteenth annual convention in Detroit, Mich., on June 6 and continue until June 10. This great gathering of metal trade men from all parts of the United States and Canada will really include an enormous industrial exposition, where, besides the technical papers and the discussions, which are always of great value to those attending, there will be seen in operation great quantities of the latest machinery and devices used in the brass and other metal industries.

The Detroit committee which has the matter in charge, has rented the Michigan State Fair Grounds, including all the great exposition buildings, for the use of this convention and the exposition which will accompany it. These grounds are in the extreme northern section of Detroit, and in order to reach them, the delegates and visitors will be compelled to pass through the most beautiful resident section of the city and enjoy a twelve-mile ride from the Campus Martius —the heart of Detroit. Street cars for the grounds pass this famous old square every minute, and the Grand Trunk Railroad runs out suburban trains.

The general committee which has the metal trades' convention in hand, consists of the following: Chairman, Frank T. F. Stephenson, of the Detroit Saw and Brazing Works; Secretary, A. Preston Henry, Standard Pattern Works; finance, Frederick B. Stevens, Foundry Supplies; plant visitation, Joseph J. Wilson, Cadillac Motor Car Company; reception, James S. Keightley, Great Lakes Engineering Works; convention session, W. P. Putnam, Detroit Testing Laboratory; ladies, De La Motte Henry, Buhl Malleable Iron Company; entertainment, Edward J. Woodison, Detroit Foundry Supply Company; boat ride, Oliver Phelps, M. A. Hanna & Co.

The chairman of this committee, Frank T. F. Stephenson, has recently made an extensive trip over the country in the interest of the convention and declares in an interview that he never saw so much enthusiasm displayed regarding a gathering of this kind, as he found in his visits to the large brass and metal centers.

"We had six or seven thousand persons present at the Cincinnati convention last year," he said, "but I have assurances that there will be twelve thousand delegates at the Detroit convention and exposition. We have all kinds of money to spend for entertainment and edification of the persons who come to Detroit on this occasion, and we are making arrangements to give them the time of their life."

Mr. Stephenson says that the programme for the convention is not yet completed. Many technical papers have been prepared and others are also being written by some of the most practical and eminent metal trades men of the country. After the papers are completed they are first passed on by an advisory committee, which determines whether or not they are up to the standard and practical, according to the most approved methods of operating great plants. As a result of this precaution imaginary theories that would prove a detriment to the general metal trades are eliminated. Persons listening to these papers and discussions, therefore, will absorb nothing but sound principles.

Five afternoons during the convention will be devoted to the reading of technical papers and discussions. At the close of each paper the author will conduct a question box and stand ready to answer any questions that may arise as the result of the investigations, as expressed in his paper. Mr. Stephenson lays great stress on the discussions that will follow the papers and addresses, as he believes that a great amount of practical information will thus be brought out. In order to bring the result of careful investigation before the delegates, lantern slides will be operated, giving scores of interesting views.

The exposition end of this convention will be a surprise to the thousands of people who are destined to attend. It is expected that nearly a million dollars' worth of machinery will be in operation. Among the firms who already have applied for space are the Oliver Machine Company of Grand Rapids, Mich., and the Standard Pattern Works, of Detroit. Scores of other foundry supply firms are now getting in line to make exhibits. Arrangements have been made with the Edison Illuminating Company to furnish an unlimited supply of power. The grounds will be policed by the metropolitan department of Detroit, and a fire company will be stationed on the grounds, the same as during the State Fair, in the fall.

The Grand Trunk Railroad will detail special equipment and train crews so as to give the best of freight transportation to the grounds. Added to all this, Mr. Arthur Waterfall, Superintendent of the Russell Wheel and Foundry Company, has volunteered the use of his company's locomotives and cars if it is necessary to quickly and conveniently transport freight to the grounds. Special street cars will leave the Cadillac Square side of the Hotel Pontchartrain, where will be established the headquarters of the convention. A representative of the committee will continually be on duty at the Pontchartrain and be in direct communication by telephone and telegraph with the office at the State Fair Grounds.

Pittsburg is after the convention for 1911, and a committee of prominent metal men of that city have already started a campaign in the interest of that city. The members have adopted the same methods that successfully secured the convention for Detroit this year. A large amount of money has been raised and will be spent freely in exploiting Pittsburg among the representatives who attend the Detroit meeting. Brass men in Detroit have no doubt about the success of Pittsburg, as the campaign even now is being pushed in an energetic manner.

An interesting piece of gossip is centered around the presidency of the American Foundrymen's Association. The office at present is held by Mr. Arthur T. Waterfall, Superintendent of the Russell Wheel and Foundry Company. Mr. Waterfall will retire at the coming election and it is declared that Maj. Joseph Spear of Pittsburg is slated for the office. He is one of the leaders in an attempt to secure the next convention of that city. Mr. Spear is supported for this place by a vast number of metal men in his organization, and it is rather evident that he will be the next President.

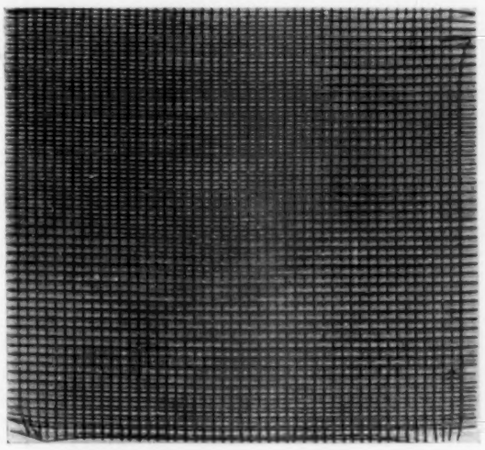
BRONZE WIRE CLOTH.

AN ARTICLE RELATIVE TO THE MANUFACTURING OF BRONZE OR COPPER FLY AND MOSQUITO NETTING.

BY JAMES A. SPARGO.*

JAMES A. SPARGO.

The manufacturing of this article is somewhat new; it was forced on the manufacturers to make something that would not rust. The old-fashioned way of making fly screen cloth from iron and steel and then painting it is practically a thing of the past for high-grade screen cloth, although of course it will always be used for cheaper grade door and window screens. The majority of people are getting sick and tired of replacing their screens every year and want a class of goods that will not be useless after one year's wear. Everyone knows that the frame of an ordinary screen after one year's wear is as good as new, but the screen is rusted out. Consequently a few years ago some enterprising manufacturer conceived the idea of substituting bronze wire cloth, which is a mixture of 99 per cent. of copper and 1 per cent. of spelter, in place of the painted wire cloth. Some people make screen cloth from pure copper, which is equally as good; the only reason that 1 per cent. spelter is used in the mixture is to make a little stiffer cloth. It would not do to make screen cloth with a less amount of copper and more spelter, as more spelter in the mixture would have a tendency to make the cloth brittle. As this cloth is all woven hard a wire that has a tendency to be brittle could not be used in its manufacture. High brass wire when it is drawn into fine sizes and left hard will fall to pieces in time. This has been tried out and it is the poorest article that can be used in the manufacture of screen cloth. The more copper that is used, the longer the life of the cloth.

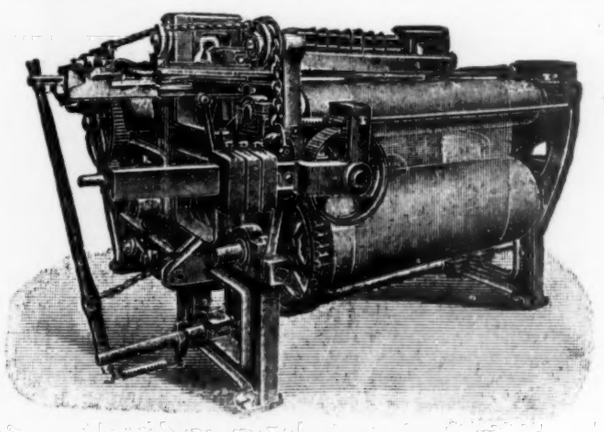


BRONZE WIRE CLOTH.

Fly screen cloth is becoming quite a factor in every household; people are beginning to realize that the dealy germ-carrying fly and mosquito must be kept out of their homes. The government statistics and investigations on this point have been spread broadcast in every newspaper in the land. It has shown its interest in this by the millions of square feet of bronze wire cloth it has bought and put into use on its buildings in the Panama Canal district for the protection of its employees making the district which was considered the hotbed of disease perfectly sanitary for the people of the North to go there without fearing the deadly germs of the insects of that locality.

The time has come when the house fly must go; time was when a fly was a fly, annoying, intrusive, but otherwise supposed to be harmless. But time flies—and men learn. Science says that the common innocent-looking house fly—the same kind of a fellow that amused you as a boy when he got stuck on your grandmother's flypaper, is as dangerous as a mad dog, a snake or a burglar, as he carries death and disease with him. The story of the mosquito is practically the story of the fly, only the mosquito makes a specialty of introducing disease germs, like malaria, yellow fever, etc., into the blood; this she does when she bites. The fly does most of his harm by putting disease germs on food and thus introducing into the system the germs of disease of the stomach and intestines, notably typhoid fever.

The manufacturing of the wire for screen cloth is a simple proposition. The first is the melting pot, where the nine parts of copper and one of spelter are melted and poured into a bar, approximately 180 lbs. each. The bar is then put into a furnace and heated to almost a white heat; it is then rolled by continuous method into ¼-inch rods, the operation of reducing it from a bar 4 to 5 inches square and 4 ft. long to a rod a ¼ inch in diameter taking about three minutes. These rods are then annealed, pickled and drawn on a continuous machine to about No. 8 Brown & Sharpe gauge wire. It is then annealed again and drawn to about No. 18 or No. 20; then annealed again and drawn into No. 29 B. & S. gauge wire which is used for the warp, No. 28 wire being generally used for the filling. These sizes are approximately 31 and 32 Old English gauge.



WIRE CLOTH WEAVING MACHINE.

With this repeated annealing the life is not taken out of the metal but it is made more pliable for use in weaving.

Manufacturers have different ideas about the kind

*President, Spargo Wire Cloth Company, Rome, N. Y.

of a loom this cloth should be woven on. The most satisfactory loom that the writer has ever used is the positive motion loom. The work of weaving wire cloth is practically the same as weaving any kind of cloth. All fly screen cloth, either iron, steel, copper, bronze or brass, can be woven on the same loom.

The manufacturing of this material is very interesting and the years are not far distant when "Father Time" will get after painted wire cloth and it will take its place with the antiques and be a thing of the past.

PLANT OF THE SPARGO WIRE CLOTH COMPANY, ROME, N. Y.

WILL ALL ENAMEL WARE OF THE FUTURE BE NICKEL-PLATED?

By B. W. Gilchrist.*

For more than fifteen years the process of applying an intervening film of nickel between the steel body of a cooking utensil and the coating of enamel with which it is finally covered, has been employed by one of the largest factories in the world. This invention, which is controlled by them under patents granted to Mr. Thomas Cochoran, has gained for their product a world-wide reputation. These patents will soon expire, and the many manufacturers making enamel utensils will be at liberty to adopt the process, which is now controlled exclusively by them.

The process is simply the coating of the steel vessel with a suitable deposit of nickel by electro-deposition. A high voltage current drives the nickel into the steel, producing practically a nickel steel alloy, which is of unquestionable advantage in preventing the enamel from flaking off, as is frequently the case where it is applied directly to the steel body.

The question which is of interest to the platers is—Will the other enamel plants, of which there are many throughout the country, adopt this method of finishing their product when the patents expire?

That the nickel surface causes a greater chemical affinity between the enamel, or glaze, and the steel body can be readily demonstrated by partially plating a vessel while leaving the remainder in its natural state. The result will be that the portion without the intervening coat of nickel shows where the enamel has separated from the steel, after burning. While this fault may be partially overcome by the use of arsenic, lead, or antimony in the enamel, their use is not only unsatisfactory but injurious, and the manufacturers are constantly striving to eliminate them so far as possible. It is, therefore, only reasonable to conclude that adoption of the nickel plating process will soon be universally adopted. This would greatly enlarge the field and many good positions be opened in this branch of the plating business.

The immense quantities of this class of goods that are daily manufactured and the close competition which exists require that they be produced at the minimum of cost and therefore necessitates rapid manipulation both in the preparatory cleaning and the plating, which is entirely different from conditions met with in other branches of the art, and a short description, I trust, will be beneficial to those who may encounter this line of work.

When the pots, pans and other culinary articles reach the plating department they are in an oily, dirty condition and must first be dipped in a weak solution of muriatic acid, and while still wet placed on a carrier and conveyed into an oven, where they are raised to a cherry red heat, when they are removed and allowed to cool before they are transferred to the pickling solution, consisting of oil of vitriol, one part, water, 20 parts, which is maintained at a heat of 110 degs. Fahr. for about 20 minutes during which time, if they have been diligently agitated, they will be bright, clean and ready for rinsing in cold water and transferring to the plating solution.

The nickel solution is made of the regular nickel salts (ammonium sulphate of nickel), but must never be allowed to stand over 2 degs. B. and not less than 1 50-100 degrees B. The current employed should be from 7 to 10 volts. Of course this will produce a dark and unsightly deposit, and as the anodes should be placed as close as possible to the article, without short circuiting, the burning of the deposit is very pronounced, and after drying can be partially removed by the hands as a black impalpable powder. The duration of the time required in the solution should never be over 10 or less than 3 minutes to obtain the necessary deposit, and of course varies with the consistency and ingredients contained in the enamel, or mass, which is later applied.

Should the deposit be bright, the enamel will not adhere, and if too much nickel is deposited the finished article will not have the beautiful, mottled surface, which is an essential feature, giving color and finish to the article.

Owing to the almost endless varieties and sizes it is necessary that tanks of large capacity be provided and center, or inside anodes, used to fit the interior of the articles. A tank 15 feet long and 5 feet wide having a capacity of 1,000 gallons and provided with 9 rods, of which two carry the center anodes, will on an average turn out 1,000 pieces a day, and the cost of the pickling, plating and drying (which is best done on a large oil oven) should not exceed $5.00 a thousand pieces. When it is considered that where the plating is omitted, the cleaning and pickling must necessarily be done, it brings the total expense of plating as low as $2.75 per 1,000 including the nickel, supplies and labor combined.

I, therefore, predict that the near future will see many if not all of these large establishments plating these goods, and that the quality of the cooking utensils will be greatly improved by the universal adoption of nickel plating.

*Foreman, Plater, Kelly, Jones Company, Greensburg, Pa.

MODERN BRONZES*

THEIR CONSTITUTION, PROPERTIES AND USES.

BY A. H. HIORNS.†

(Continued from February.)

SPECIAL BRONZES.

We have already seen that bronzes with zinc have the properties modified. In small quantity zinc causes a better casting and more free from blowholes, since it plays the part of a deoxidizer in forming oxide of zinc. From researches already made on the mechanical properties, we may say that the tenacity and elastic limits are clearly raised by the addition of zinc not exceeding two per cent., but above that there is a diminution of tenacity and hardness as shown below:

Composition.			Mechanical properties.			
			Tensile strength	Elastic limit		
Cu.	Sn.	Zn.	in tons	in tons	E%.	Hardness.
90.34	9.62	0.04	17.0	7.3	24.5	58
90.45	8.93	0.62	17.8	7.9	23.5	53
90.24	6.90	2.86	14.4	6.4	27.5	54
91.36	4.52	4.12	10.3	4.1	16.5	49
90.47	2.90	6.63	11.4	3.8	23.0	49
90.35	0.00	9.65	6.4	3.3	13.0	49

From this we see that zinc begins by increasing the tenacity and after a certain percentage by diminishing it, as well as the elastic limit. Beyond about 3 per cent. zinc the elongation diminishes. The hardness also diminishes slowly. From the point of view of the constitution, the zinc passes into the alpha solution.

BRONZES WITH LEAD.

Bronzes with lead have been employed for many years as bearing metals, as the effect of lead in bronze

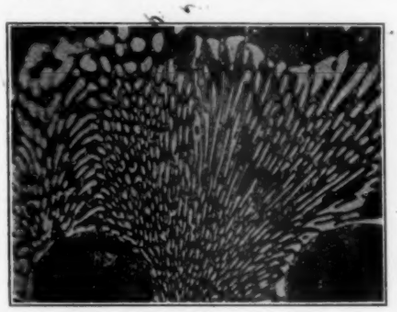


FIG. 4. BRONZE WITH HIGH PHOSPHORUS.

is to increase the plasticity. Lead does not, properly speaking, alloy the bronze as shown by the microstructure in which the lead is seen as more or less round black patches. Very little lead enters into solution. Charpy states that if the alloy is examined by oblique illumination, the black patches are seen to contain small blowholes, the walls of which are bright and seem to be bordered with small crystals of lead. The phenomenon may be explained by the partial volatilization of the lead in the midst of the alloy, and is intensified when the alloy is cast at a high temperature. The alloy should therefore be cast at the minimum temperature. With much lead liquidation takes place, since the lead remains liquid until about 330 degs. C., and tends to fall in the mass in virtue of its great density. This presence of metallic lead may be proved by taking an alloy of 8 tin, 8 lead and 84 copper, break and allow to cool slowly; then expose to an atmosphere of sulphuretted hydrogen, when a pronounced black ring will appear, the remaining portion being only colored brown. Guillet made an alloy, as put into the crucible, of copper 84, tin 8, and lead 8, and allowed it to cool normally. A slice on the edge gave 82.75 copper, 9.25 lead, and 8.31 tin.

In the center the composition was 83.7 copper, 7.4 lead and 8.9 tin. With gun metal (9-1) to which lead was added, the tenacity and elastic limit remained the same until two per cent. was exceeded, then the strength and elongation diminished. An increase of lead slowly diminishes the hardness, but increases the brittleness. In consequence of liquidation we never know how much lead may be on the surface of an alloy, used for bearings and exposed to friction.

Here are some alloys which have been used for bearings:

Copper.	Tin.	Lead.	Antimony.	Phosphorus.	Zinc.
84.65	6.60	8.49	0.16	...	0.10
82.55	2.65	10.86	2.97	0.21	0.60
84.70	10.05	4.50	0.14	0.11	0.46
82.30	8.98	7.27	0.14	0.39	0.10
79.70	10.00	9.60	...	...	0.70
77.00	8.00	15.00	...	...	...
79.00	8.00	8.00	...	...	5.00

I may say that the best results for bearings have been obtained by an alloy of copper 84, tin 8, lead 8. Henrickson and Clamer in America found that nickel possesses the remarkable property of preventing the liquidation of lead in bronze, and I understand these alloys are largely used in America and in France in railway wagons and various machines, and give excellent results, provided the pressure does not exceed about 600 lbs. per square inch. The usual composition is copper 64, lead 30, tin 5 and nickel 1. Such an alloy is sensibly homogeneous. Analysis of portions taken from different parts of a casting give practically the same proportions of the constituents. Nickel seems to form a metallic network, which maintains the lead in position until it solidifies. Beyond 30 per cent. lead the homogeneity ceases and the lead largely settles at the bottom. Therefore with 5 per

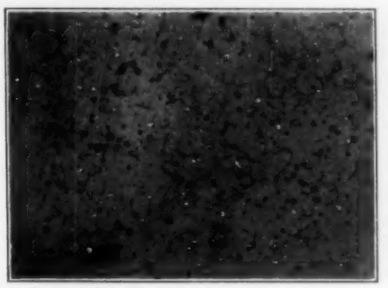


FIG. 5. PHOSPHOR BRONZE WITH LEAD, SHOWING FREE LEAD.

*Paper read before the Birmingham Metallurgical Society.
†Professor of Metallurgy.

cent. tin and 1 per cent. nickel lead may be present up to 30 per cent.

PHOSPHOR BRONZE.

The action of phosphorus on bronze is twofold: there is a certain small portion which acts as a deoxidizer by reducing the oxides of copper and tin, forming oxide of phosphorus, which unites with metallic oxides to form a slag. If more than is required for this purpose be added, it makes the alloy harder and more brittle. Guillemin states that phosphorus in bronze imparts a peculiar mosaic appearance to the microstructure which is absolutely characteristic. If more than 4 per cent. of zinc is added this structure is not clear. The phosphorus when in small quantity probably enters into the alpha solution.

If phosphor bronze is cast at too high a temperature we see issue from the top of the casting and in the gate, liquid worm-like filaments, solidifying in the form of mushrooms. The phosphorus and tin occur in them in greater proportion than in the main body of the alloy. The properties of phosphor bronze are similar to those of ordinary bronze, but enhanced. Figure 4 shows bronze with high phosphorus.

Guillemin gave some mechanical results of phosphor bronzes as follows:

Type.	Cu.	Sn.	Zn.	Ph.	P.	Tensile strength in tons.	Elongation. per cent.
No phosphorus..	89.0	9.0	1.5	0.5	.....	18	24
With phosphorus	89.0	9.0	1.5	0.5	trace	20	41
Do.	89.0	9.0	1.5	0.5	0.13	18	19
For bearings....	83.5	16.0	...	...	0.50	15	8
Do.	85.6	14.0	...	...	0.40	14	12
Gun metal with trace of P rolled and annealed...	90.0	10.0	...	...	...	25	67

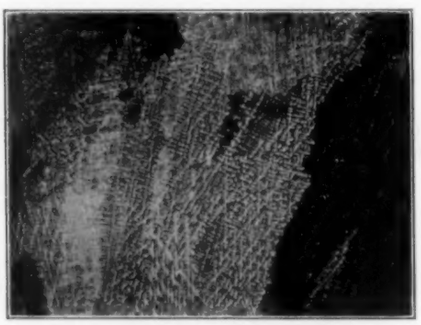


FIG. 6. ALUMINUM BRONZE WITH 0 TO 7.35 PER CENT. COPPER.

We see that when the phosphorus much exceeds the amount required for deoxidation the tenacity and elongation diminish, while the brittleness and hardness increase. Beyond 0.25 per cent. phosphorus the hardness remains stationary.

The composition of phosphor bronzes varies with the uses to which they are applied, as follows:

	Copper.	Tin.	Phosphorus.
Rolling and drawing.	95-96	5-4	trace
Steam valves and accessories	93	7	trace
Gearing	89-90	11-10	trace
Bearings	82-86	18-14	0.5-0.25
"	79.7	10	0.30 and 10% Pb.

(To be Continued.)

1909 REPORT AMERICAN BRASS COMPANY.

STATEMENT OF NEW ENGLAND'S LARGEST ENTERPRISE.

Net earnings of the subsidiary companies of the American Brass Company, of which Charles F. Brooker is president, for the fiscal year ended December 31 last were $1,767,546, an increase of $730,028 or 70 per cent over the previous year.

The American Brass Company was formed early in 1903. It owns the entire capital stock of the Ansonia Brass & Copper Company, the Benedict & Burnham Manufacturing Company, the Coe Brass Company, and the Waterbury Brass Manufacturing Company. Through its subsidiaries it owns the Ansonia Land & Water Power Company, the Birmingham Brass Company, Chicago Brass Company and Waterbury Brass Goods Corporation. From its subsidiaries the company in 1909 received dividends of $1,075,480 compared with $928,699 in 1908 and paid dividends of $900,000 or 6 per cent., compared with but $787,500 in 1908.

Income account of the parent company for the past year shows total receipts of $1,089,583 and expenditures of $1,061,957, of which $900,000 was dividends and $161,957 current expenditures of the corporation, leaving balance of $27,626. The balance sheet of the American Brass Company as of January 1, 1910 and 1909, we present herewith:

ASSETS:

	1910	1909
Cash	$27,626	$4,980
Due from subsidiary companies.....	2,344,756	2,333,756
Accounts receivable	59,390	19,079
Birmingham Brass investment.....	108,161	168,162
Inv. cap. stock subsidiary companies....	12,500,080	12,500,080
Total	$15,040,023	$15,026,057

LIABILITIES:

Capital stock	$15,000,000	$15,000,000
Surplus	40,023	26,057
Total	$15,040,023	$15,026,057

The combined trial balance of the subsidiary properties in the American Brass Company as of January 1, 1910 and 1909, we present herewith:

ASSETS:

	1910	1909
Real estate, machinery and tools.....	$9,036,980	$8,953,147
*Permanent improvements spent.....	145,433	83,833
Cash	1,083,501	1,002,239
Accounts receivable	3,541,364	2,959,338
Bills receivable	456,653	380,352
Stocks owned in other companies.....	3,130,400	3,130,201
Patents	1,000	1,000
Merch'dse., raw, wrought and in process	4,831,481	4,172,222
Total	$22,226,816	$20,682,333

LIABILITIES:

Capital stock	$5,550,000	$5,550,000
Current accounts and bills payable....	1,898,472	1,067,631
Loans from parent company.....	2,344,756	2,333,756
Surplus	11,433,587	10,741,521
Reserve for contingencies.....	1,000,000	989,425
Total	$22,226,816	$20,682,333

*After deducting $400,000 charged off each year for depreciation. In 1909 $500,000 was charged to depreciation. American Brass stock figures out a book value of $136 per share. At the recent annual meeting of the American Brass Company, John P. Wayland was elected director in place of his father, C. N. Wayland. Other directors were re-elected.

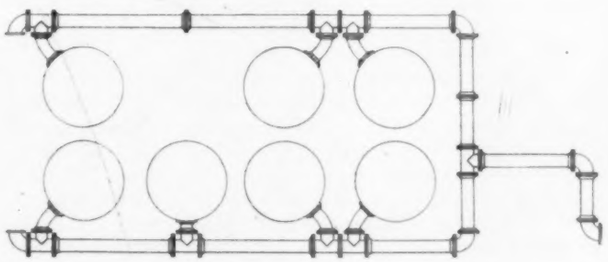
THE USE OF ALUMINUM FOR NON-CORROSIVE PURPOSES.

Application of the Bi-Metallic Tube.

By Edward K. Davis.*

Aluminum possesses the quality of resisting the corrosive action of many substances which affect copper, brass and bronze—among others, sulphates, nitrates, ammonia and organic acids. Manufacturing plants having occasion to handle any of these in solution are likely to obtain good results by the substitution of aluminum.

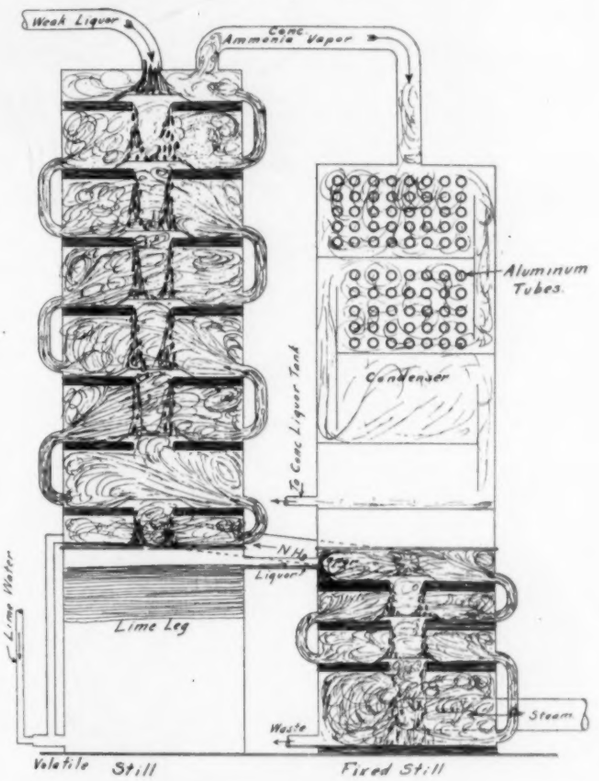
In the manufacture of paper pulp by the sulphite process, one of the obstacles has been the difficulty of securing a metal that will not be affected by sulphurous acid gas and which at the same time is free from mechanical drawbacks. Sulphurous acid gas is an essential feature of the sulphite pulp process and the pipes required for handling it in a large mill are quite extensive. Prior to the introduction of aluminum, bronze pipe was commonly used, but it deteriorates rapidly under the action of SO_2 gas and its replacement has been a constant source of expense. Aluminum, on the other hand, is but slowly affected by the gas and an installation of it can be regarded as practically permanent. The accompanying drawing "A" shows an aluminum cooler for reducing the temperature of SO_2 gas after leaving the digester where the plup is treated or "cooked." It is in service at the Champion International Paper Company's plant at Lawrence, Mass.



A. ALUMINUM RELIEF LINE SYSTEM FOR SULPHITE PULP PROCESS.

The production of ammonia as a by-product of coke involves the use of condensing apparatus to cool the ammonia gas, either at the top of the concentrator or in a separate compartment near by. Pure ammonia is destructive to copper and copper alloys, and the usual impurities in crude ammonia, viz.: hydrogen sulphide, sulphurous and sulphuric acid gas, attack iron. Aluminum has the double quality of resisting ammonia and its common impurities. Some of the large by-product coke oven companies use it, but its use has not spread to the smaller companies. Illustration "B" shows location of aluminum tubes relative to the main portion of the concentrator.

One of the principal uses of aluminum tubing, as well as other forms of aluminum, is in the manufacture of stearic acid and in the production of soap, candles and other products where stearic acid is the principal constituent. Stearic acid for use in soaps should be free from color, a result which is impossible to secure if the apparatus and pipes by which it is made and carried from place to place are made of copper. The verdigris which gathers on copper surfaces during the periods when the apparatus is not in use wears off and stains the product in the first few days of operation. In stearic acid for candles any mineral matter is likely to gather on the wick of the candle and cause it to burn irregularly. As aluminum has been found to be absolutely free from corrosion by stearic and similar acids, it is used in practically all candle factories and many soap concerns having careful regard to the quality of product. Illustration



B. TYPICAL AMMONIA CONCENTRATOR, SHOWING LOCATION OF ALUMINUM TUBES.

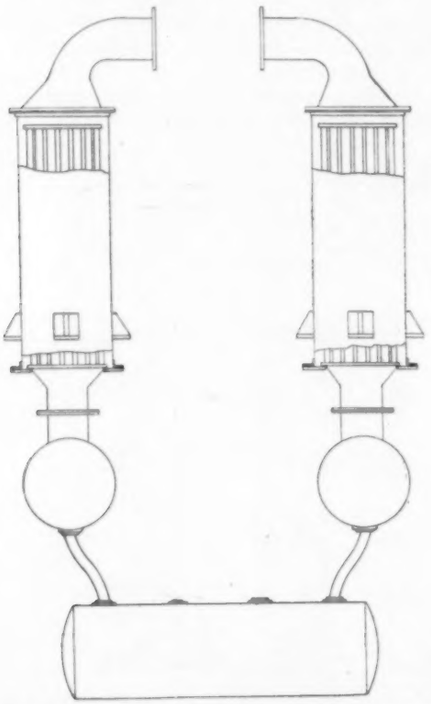
"C" shows condensing apparatus for hot stearic acid, made of aluminum and connected by aluminum pipes.

The principle of protecting one metal by another which is electro-positive to it, has a striking example in aluminum-lined condenser tubes. The principle is the same as that of coating black iron plate with zinc, i. e., by making what is known as galvanized iron. Zinc is electro-positive to iron; consequently when a sheet of steel is coated with zinc and afterwards exposed to the weather, the moisture existing in the air causes galvanic action between the steel plate and its zinc covering. The zinc rather than the iron is affected and a thin coating of zinc oxide, very resistant to corrosion, is formed and prevents the iron from being attacked. Similarly, copper coated with aluminum, as in the case of an aluminum-lined condenser tube, is not affected by the action of whatever cooling agents may be passing through the tube, until such time as the aluminum lining, which is generally

*Superintendent Aluminum Company of America, Pittsburg, Pa.

also quite resistant to corrosive action, has been eaten away. Condenser tubes made on this principle have been known to last twice as long as brass and copper under similar circumstances.

Aluminum tubing, solely on the basis of strength, is not preferable to copper. In common with most metals it is improved by cold working. The tensile strength of hard drawn aluminum tube 1 inch outside



C. CONDENSER SYSTEM WITH TANKS FOR STEARIC ACID.

diameter and with walls .065 inches thick is approximately 23,000 pounds per square inch. A test of the strength by subjecting the tube to water pressure shows a maximum fibre stress of about 22,000 pounds per square inch. The difference is due to the fact that a bursting test strains the tube across the grain, whereas the usual test by pulling is with the grain. Similar copper tubes under the same water pressure test will resist approximately 36,800 pounds per square inch of surface exposed, which is equivalent to a maximum fibre stress of 33,000 pounds per square inch. For practical purposes in the design of apparatus requiring tubes, aluminum can be reckoned at about the same strength as copper, except in cases where heavy pressures are to be sustained. In such instances the thickness of aluminum pipe should be increased and carefully proportioned to the strain to be resisted. As the main use of seamless tubing of brass, copper or aluminum is for the purpose of cooling or evaporating, the ability of the metal to transfer heat is an important question, although its importance is often over-estimated.

The resistance to transmission of heat is mainly by the scale of incrustating material that gathers on the inside or the outside, whichever may be opposite the cooling agent. Perfectly clean tubes will transmit about the same amount of heat, regardless of the metal of which they are made, although by very careful measurements it has been found that the metal makes a certain difference, the amount of variation being measured with considerable accuracy by the difference in electrical conductivity. None of the commercial metals are superior to copper in this respect. The heat-carrying power of copper is reduced by the admixture of an alloying ingredient in the same way that its power to transmit electricity is reduced. Steel and lead have a comparatively high resistance to the transmission of heat. The efficiency of aluminum is less than that of copper and more than that of the other metals mentioned.

ZINC DUST.

Zinc dust is an impalpable powder which forms in the distillation of zinc when the zinc vapor is cooled too rapidly in the condensers or is diluted by too large a volume of other gas. As noted in the preceding pages, it may constitute a large proportion of the metallic zinc obtained in electro-thermic zinc smelting, but in ordinary retort smelting it usually amounts to between 3 and 10 per cent. of the reduced zinc. The powder consists of metallic zinc, with about 10 per cent. zinc oxide, which probably exists as a film surrounding the metallic particles. These particles cannot be made to coalesce by heating unless under great pressure but must be again vaporized and condensed.

Zinc dust differs from metallic zinc in other physical properties, such as rapid oxidation, absorption of hydrogen, and generally greater chemical activity, resulting at times in spontaneous combustion or explosion. These properties are believed by Sang* to be due to conditions of stress resulting from rapid solidification, somewhat analogous to the condition in "Prince Rupert's drops."

These peculiar properties of zinc dust are the cause of many of its uses. Under the name of "indigo auxiliary" a paste of zinc dust is used to discharge locally the color in dyeing cotton goods, giving a white pattern on the background of dye. Zinc dust is used in fireworks and in making hydrogen for balloons. It is the basis of the various methods of dry galvanizing, and is also used to furnish the zinc solution in electro-zincing. One of the most important uses of zinc dust is as a substitute for zinc shavings in zinc precipitation in the cyanide treatment of gold and silver ores. For this purpose it is cheaper, quicker, more effective, and more convenient than zinc shavings.

In American zinc-smelting practice, the zinc dust has been charged back into the retorts, since, under the former tariff, if sold as dust, it came into competition with foreign zinc dust admitted free of duty, whereas recovered as spelter it was protected by an import duty of 1½ cents per pound. Hence the small quantity of zinc dust heretofore used in this country has been imported from Belgium and Germany. The quantity thus imported from Europe has not been recorded separately by the Bureau of Statistics, being included with all other "articles in a crude state used in dyeing and tanning." The only statistics available are those of the exports of zinc dust to the United States from Germany as given by Paul Speier in the London Mining Journal. According to this source, ther was imported from Germany 946 short tons of zinc dust in 1907, and 1,312 short tons in 1908. The tariff act of 1909, as shown on a preceding page, establishes an import duty upon zinc dust of 1⅜ cents per pound.

*Sang, Alfred, Old and new methods of galvanizing: Proc. Eng. Soc. Western Pennsylvania, vol. 23, 1907, pp. 546-571.

ZINC SMELTING.

Description of the Methods for Winning the Metal from the Ore.

By D. J. Lemal.

D. J. LEMAL.

When I wrote my article entitled "A Historical Sketch of the Zinc Industry in Europe and America"* I had no idea that it would be read in so far a country as Japan with interest enough to request me to write more on zinc. It seems that in that country they have discovered the zinc ore, but so far no extraction from the ore has been done.

For the extraction and reduction of the metal from its ores the principal materials necessary are coal and clay (fire clay), as we have to have the latter to build the inside of the furnace, which must be prepared to resist the heat. The pipe clay used in the fire would not stand the heat without cracking; we must make it porous by adding hard burned clay with the new clay in proportion of about one to one, which is to be thoroughly mixed before being used to build the furnace.

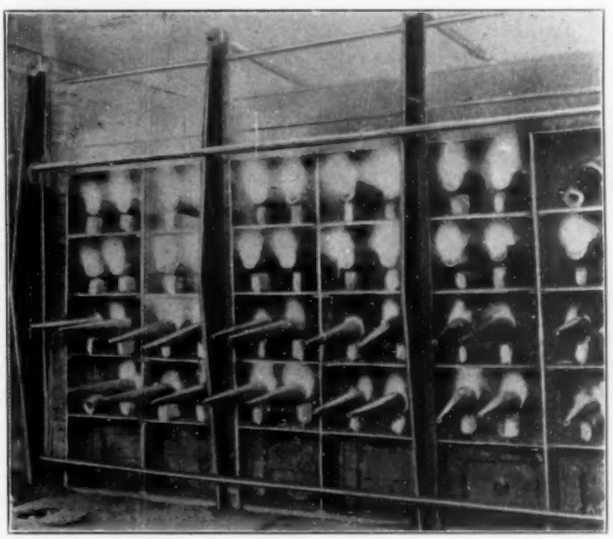
I show a cut of a furnace, a Belgian one, as this is more universally used than the Silesian. The Belgian furnace has a number of rows of long cylindrical retorts, one row above the other, eight or nine rows high. All furnaces need not have the same number of retorts, as some prefer more than others. These retorts also differ in size in different works, but they must be all one length. In a furnace which is four feet or over and about 8 inches or ten inches in diameter, these are placed in the furnace in an inclined position, resting two or three inches at the back and the same in front. On the bottom part there is what seems to be a smaller retort; in fact it is only four or five inches in diameter but the same length; this is never charged with ore or anything else; it partly protects the charged retorts from the sudden violent heat and also distributes the heat more evenly throughout the furnace.

After the retorts are charged with a mixture of fine coal and ore, this mixture is heavier in ore in four or five of the bottom rows than in the top ones as these are charged only once every 24 hours, while the bottom rows are charged twice in that time. The charging of the ore mixture is done with a long scoop with a handle four feet long, all of steel and iron; the scoop part itself is a couple of feet long, shaped a little smaller than half the circumference of the retort; some dexterity is required to throw in the charging mixture in the farthest end of the retort with this scoop. The retort, I should have remarked, was closed at the end, or made solid in the making of it, and the mouth open; it has no driect connection with the fire in the furnace. Instantly after the retort is charged a long, sharp ⅝-inch rod is shoved in on the top part to the end of the retort to let the steam escape, as the charge is mixed with a little water to hold it together. It is not unusual and is laughable to see the charge shoot out and cover the charger from head to foot, almost knocking him over; it is uncomfortably hot for him but not hot enough to burn him. It is laughable to the other workmen, because it shows that he did not have his wits about him or was too slow, if not a little tipsy from liquor, as they are great drinkers.

THE REDUCING PROCESS.

After the retort is charged a man follows with a clay condenser, conical shape, one end of which fits in the mouth of the retort; the front of it is adjusted out straight and supported with a piece of brick by the long shift. The short shift follows with a red loam and plaster or lutes the retort, going over it with an iron stamp, which is a half-moon shaped iron with a handle. It takes the best part of the forenoon to charge a furnace, but by 3 o'clock p. m. they commence to draw metal in a ladle held underneath, supporting it with one hand while drawing the metal with a scraper, which is a hooped piece of iron flattened at the end. This is never pushed any farther than the end of the condenser or the mouth of the retort. The zinc distills to the top of the retort as steam would and runs down along the top to the condenser, where it drops to the bottom, from which it is drawn and poured into ingots. They repeat the drawing several times, and by 5 or 6 o'clock the bottom rows are ready for another charge, but the top ones are not recharged until the next morning.

While the melting is going on, each condenser is hooded with an iron tube, called a "prolonger," conical shaped in some works, while in others it varies in shape. This catches a zinc oxide, which is dark blue and chemically called "tutty." It makes an excellent paint, but most works recharge it and convert it into metal. About the hottest work is when the furnace is cleaned



SET OF ZINC REDUCING FURNACES.

(by furnace here I mean retorts); each retort has to be cleaned of its cinders while almost white hot, for if allowed to cool they would cake together and the furnace would be ruined. In the case of some of the ores that contain iron the cleaning process must be done very quickly, for this quality of ore is very hard to clean even while it is hot, and it is a very difficult task to remove the cinders even with long iron chisels, hooks and scrapers. The refuse cinders fall within four or five feet of the workers, and while some throw water on to keep down the heat, this is returned to the furnaces that are run by blast, by means of a large fan.

*Metal Industry, April, 1909.

There are a number of furnaces that are run by a common air draft, which is obtained by means of a cellar underneath the furnace, and where there are a number of these furnaces in a row these cellars look like a tunnel with a ceiling of fire. With this class of furnace there is an opening at the front through which the red hot cinders fall, instead of at the feet of the workmen.

The furnaces are usually built in sets of four, set back to back and having their sides close togther, in order to economize heat. Each furnace has a fireplace running the full length of the furnace, and there are two fireplaces in a pit. One large chimney with four flues will serve all four furnaces, using a brick damper to each flue. Some works prefer to use a separate chimney for each furnace, made up of tubular short sections of burned fire clay.

ELECTROLYTIC COPPER.

SOME DATA RELATING TO ITS SEPARATION FROM THE PRECIOUS METALS ON A LARGE SCALE.

BY FREDERICK BONNER FLINN.*

F. B. FLINN.

In 1882-1883 an experimental plant for the electrolytic refining of copper was erected in Newark under the direction of Edward Balbach and F. A. Thum. As is usual in starting up such a plant many difficulties had to be overcome, but that they were successful is evident, as other plants began to start up, notably the Baltimore, Anaconda and Great Falls in 1887, 1891 and 1892 respectively. Twenty years ago the Balbach and Bridgeport, Conn., plants were the largest in America, and their combined output per diem was less than 24 short tons. But the growth has been enormous until the present day, when over 764 tons daily, or nearly 279,000 tons annually, besides 26 million ounces of silver and 346,000 ounces of gold are refined. Or 80 per cent. of the entire output of refined metal in the United States is produced by the electric current.

There is yet a prejudice in the minds of some foremen that Lake copper is better than electrolytic, without realizing that it is due to the impurities in Lake. Lake copper is used in such cases as making cartridge shells, where it stands the hard usage much better. In this case a certain amount of impurities seem to aid in mechanical toughness. In the future there will be but two kinds of copper quoted, namely, that of high conductivity and casting copper.

The copper for electrolytic refining is cast directly into anodes from the converter or reverberatory furnace. These anodes are usually 3x2 ft. by ¾ in. thick and are cast with handles for hanging in the electrolytic tank. They are refined in the furnace to as high a degree as can be done commercially; and are from 96 to 99 per cent. copper, the remainder being such impurities as silver, gold, arsenic, antimony, etc. The tanks are lined with lead and are usually six inches wider than the anode. and about ten inches deeper. The idea of having it deep is to avoid short circuiting on account of the slimes. In the tank are placed alternately the anodes and cathodes. The latter are thin sheets of copper, whose surface has been greased to permit the stripping off of the deposited metal. The number of anodes and cathodes to a tank depends on the plant and room.

The solution or electrolyte as used in this country contains not less than 12 per cent. and not more than 24 per cent. of bluestone (copper sulphate) and from 4 to 10 per cent. free sulphuric acid. It is customary to add about 300 cc of hydrochloric acid to each tank to precipitate out any silver that may be dissolved, and also to prevent sprouting, though there is considerable doubt as to whether it does prevent sprouting. It is also necessary for effective work to keep the temperature between 40 and 60 degs. Cent., because it decreases the electrical resistance of the solution, and increases the tensile strength of the depositing copper. The solution also must be kept in circulation.

The current used is generally from 4 to 45 amperes per square foot of cathode surface, depending on the cost of power and the impurities in the anodes and solution. From 12 to 15 amperes have been found to give the best results. The voltage is about 0.10 to 0.3. It has been found by experiment that one ampere of current will deposit 1.18656 grains of copper in one hour, which means that one ampere of current will deposit one ounce of copper each 24 hours. Having this fact, it is easy for the superintendent to keep track of the efficiency of his plant by measuring his current and weighing the deposited copper. A careful test must be made of the solution each day for acidity and copper; and a good watch kept on other impurities, such as iron, arsenic and antimony. When the solution becomes too foul, it is purified, as a rule, by drawing off one-fifth of the solution and replacing it by fresh. The solution withdrawn is boiled in lead-lined tanks with scrap copper to use up the free acid and then the copper sulphate is crystallized out.

AN ELECTROLYTIC COPPER CATHODE.

During the electrolysis the silver, gold and platinum remain undissolved and fall to the bottom of the tank. However, if the solution should become neutral some sil-

*Chemist, Balbach Smelting and Refining Company, Newark, N. J.

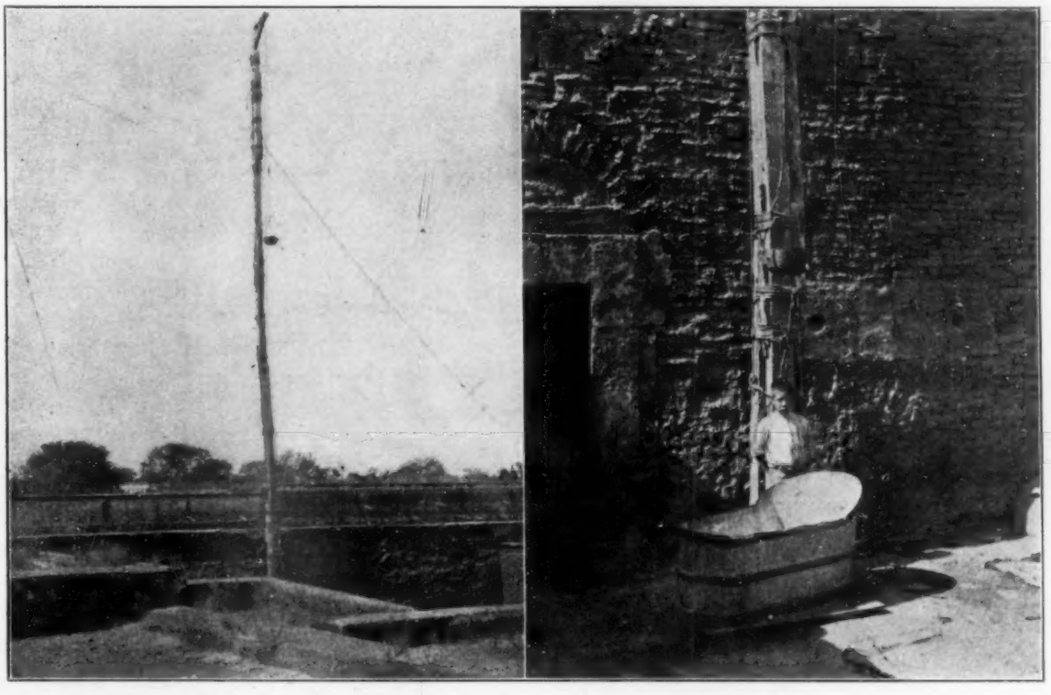
ver dissolves and is deposited. The electrolytic copper contains from 0.20 to 1 ounce of silver, but it is supposed that it is mechanically included. The slime contains silver, gold, copper and lead, as well as other impurities. The silver contents range from 1,000 to 22,000 ounces and the gold up to 200 ounces per ton. If the refinery is equipped with a desilverizing plant, the usual plan is to dry the slimes, place about 10 to 15 pounds in paper bags and then add to the retort metal on the cupel hearth. The copper and other impurities become oxidized and slag off, while the gold and silver remain with the retort metal on the cupel.

Another practice is to treat the slimes in a lead-lined tank, which is heated by steam pipes, with sulphuric acid. It is kept at a boiling temperature for about 12 hours, when most of the copper is dissolved. But this operation must not be carried on too long, or else some of the silver is dissolved. Metallic copper precipitates the silver from silver sulphate and the solution is tested from time to time, until no more silver is in solution. The slimes are washed several times with hot water by decantation, dried in an iron pan and melted with sand and soda ash in a reverberatory furnace. The resultant dore bars are usually 950 to 960 fine silver and 10-20 in gold. The dore bars are now placed in a cast iron kettle and parted with sulphuric acid according to the process used in the United States Assay Office, or it is parted electrolytically by the Moebus or Thum-Balbach process. The cement silver obtained in acid parting after washing is melted in a refinery furnace with addition of nitre and cast into bars running in fineness 998 to 998.5 in silver.

The gold is boiled further with sulphuric acid and a lump of nitre (sodium nitrate) to remove the last traces of silver and to lessen the quantity of float gold. After washing by decantation and drying, it is melted under borax and cast into bars of 993 to 996 fineness.

SHOT MANUFACTURE IN MEXICO.

It is interesting to refer to the primitive methods of making shot employed in a number of instances in Mexico. The accompanying picture shows a tower in two sections; it consists of a spliced pole lashed together with rope, at the top of which is lashed a cross-arm, attached to which is a pulley which is used for hoisting a pot of molten lead to the top. The workman climbs the pole, ladles the molten lead out of the pot, which drops into a bathtub full of water at the base of the "tower."



TOP. BASE.

A MEXICAN SHOT TOWER AT GUADALAJARA, MEXICO.

It can well be imagined that the shot thus produced is very irregular in form and resembles gravel more than shot. No effort is made at screening or sizing the pellets and if weight were not a necessary quality, gravel might be used instead. This method of dropping shot was in vogue in Mexico some 15 years ago, and doubtless is still practised in some sections. The output was used by pot hunters who erected a battery of two tiers of gas pipe on the shore of a lake, the upper tier slightly inclined, with all the barrels connected by fuse. The method was to train this battery of gas pipe on a flock of ducks, the lower tier of barrels discharging first; the upper tier following in discharge trained at the ducks in flight. It is said that literal slaughter of the ducks resulted.

CHINESE CURRENCY.

"For many years the Mexican dollar was current at and in the vicinity of the coast and river ports, but now Chinese dollars are coined at the provincial mints at Tientsin, Nanking, Wuchang, Hankow, Canton and elsewhere, but the mintage of one province is only accepted at a discount in another province.

"Subsidiary silver coins, 10-cent and 20-cent pieces, are also made at the provincial mints, but these are never worth their face value."

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THE STORAGE BATTERY CAR.

ITS EFFECT ON COPPER AND NICKEL CONSUMPTION.

The electric storage battery in its improved form so long promised and so eagerly awaited for, is now a fact. The experiments conducted in New York City with the Edison battery during the past month have resulted in proving the battery to be a commercial success. This battery is the result of years of labor and investigation by Thomas A. Edison, and bids fair to mark the beginning of a new era in electric railway transportation. The positive electrode of this battery, according to a recent patent (948,568, February 8, 1910), granted to Thomas A. Edison, consists of a mixture of ground flake nickel, cobalt alloy of nickel and cobalt and nickel flake hydroxide. The electrode is built up as follows: The nickel hydroxide is first ground so as to present particles of a definite size ranging from 20 to 60 mesh. The ground material is then mixed with molasses or some other sticky material, until the surfaces of the particles are covered with a thin layer of the material. After the nickel hydroxide particles have become intimately mixed with the binder and while it is still in the mixer, the flake nickel is added and the whole then thoroughly mixed.

After the mixing operation the mass is dried and is then applied to the pockets of the battery grid. Pressure is then applied, generally about two thousand pounds per pocket. The electrode plates are then immersed in water slightly alkaline, to prevent rust, and the molasses thoroughly dissolved out. The plates are then dried and again subjected to pressure, this time of six thousand pounds per pocket. The plates are now ready to be assembled in the battery. The grid plate consists of thirty small tubes made of steel, nickel plated, and perforated with very small holes to allow of the circulation of the electrolyte.

The negative plate consists of a sheet of steel, nickel plated, having twenty-four flat rectangular pockets filled with innumerable small holes. These pockets are filled with powdered oxide of iron. These plates alternate in rows with the positive plates. The electrolyte is caustic potash and circulates through and around both plates. The whole battery is enclosed in a can of thin steel, nickel plated both sides and welded at the seams autogenously, making leakage or breakage from severe vibration impossible. The walls of the can are corrugated so as to give the greatest amount of strength with a minmum weight.

Judging from the performance of the trolleyless car in New York last week, the conclusion is justified that the day of the trolley-run car is passing. The present experimental car has finished a mileage of 800 without

repairs of any description other than replacing the brake shoes. The cost of operating the car figured 6.4 mills per mile, and the car has been run for 8 mills per hour. The inventors claim that the cost of current cannot possibly exceed 2 cents per hour on the streets of New York City. But the success of the battery commercially does not depend upon mileage, it is more a question of expense of the battery and its efficiency. It would be a very simple matter to arrange for battery or cell renewals at appointed stations along the line.

One of the chief advantages, of course, of this battery over the old style of lead storage battery is the difference in weight, which is put at one-half. A less weight means more cells in the same space, and consequently more power. It is claimed also that, cell for cell, the new battery has a higher efficiency, but this at present writing seems to be a disputed point, particularly under the influenc of heat. It will be interesting to examine the efficiency curves taken under different temperature conditions. However this may be, there is no disputing the fact that this battery shows a wonderful advance in the storage battery field, and fully justifies the world's belief in Mr. Edison's ability to fulfil his promise made so long ago.

In reviewing the possibilities of this battery in its various applications, we cannot fail to appreciate the tremendous saving in trolley operation alone that may be ultimately effected. The consumption of copper may be seriously affected, for it will mean the elimination of the wire conveying system. The millions of miles of trolley wire now in use will not be required, and therefore other uses will have to be found for this mass of material. Trolley wire, in order to furnish the necessary capacity for carrying the voltage required for car propulsion must be of a gauge that runs into pounds very fast. As the manufacture of trolley wire constitutes a very considerable industry, the success of the new battery may well be viewed with apprehension by the copper wire manufacturers.

Another important item of saving will be the overhead maintenance in the way of poles and supporting wires, etc., and also in the elimination of the brass trolley wheel. Here, again, a very extensive business seems bound to be affected. But, on the other hand, with regard to conservation of the copper supply, it may prove to be beneficial in making the world's copper stock last so much longer.

The automobile industry may, too, in time be affected. An electrically driven machine on the road, is, of course, the ideal one. Any means that will remove from the already polluted atmosphere of our cities the smoke and odor of gasoline, will be hailed with delight. This, however is of minor importance when compared with cold, hard business considerations. Some of these may be cited under the important head of economy: Greater simplicity, hence fewer repairs; lower insurance, no elaborate repair tools, small loss of power, ease of operation, not requiring a skilled driver. Under the head of time, we have: Simplicity of adjustment, no cranking, instant readiness, develops power despite conditions of weather, and less time in repair shop.

Of course probably the storage battery auto will not be able to go as speedily as the many cylindered gasoline, but with speed ordinances daily being enacted, and the public gradually becoming saner, this objection will be removed and we shall have fewer tragedies of the road, and "joy rides" will lose their attractiveness.

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NEW BOOKS

THE JOURNAL OF THE INSTITUTE OF METALS. Volume II. Edited by G. Shaw Scott, M. Sc., Secretary. Size, 5½ x 8¾ inches; 352 pages; numerous illustrations. Published by the Institute of Metals, Caxton House, London, England.

This book is the second volume of the proceedings of the Institute of Metals. The book is divided into two sections. The first treats of the minutes of proceedings at the Manchester meeting, Oct. 14-15, 1909. The second section is devoted to abstracts of papers relating to the non-ferrous metals and the industries connected therewith. The book itself makes a most valuable addition to the literature of non-ferrous metals, of which there is too little. As these two volumes represent barely a year's work of the institute, they make a remarkable showing for so young an organization. One thing might be said, however, that it is now in order to have more papers prepared for the institute of a more practical nature. The majority of the papers so far published have been on the techno-scientific side, and with a number bearing on the eminently practical side the two sets would make an excellent balance for the library of the non-ferrous metals.

THE THEORY AND PRACTICE OF ENAMELING ON IRON AND STEEL. By Julius Grunwald, Technical Chemist and Works Manager, Lafeschotle. Translated by Herbert H. Hodgson, M. A. (Camb.), B. Sc. (Lond.), Ph. D. (Heidelberg), Lecturer and Research Chemist at the Municipal Technical College, Bradford. Size, 6½ x 9 inches; 131 pages. Price, $2. J. B. Lippincott Company, Ltd., Philadelphia.

It is said that we must go to Germany and France for excellence in enameled ware such as is used for ordinary household purposes. It is entirely fitting then that this book should be written by a German practical man of large and varied experience. Prof. Grünwald is now chief chemist and director of a large works in France. Such a recommendation of the author is sufficient proof of the reliability of the formula given in the book.

The book treats specially of the process of enameling hollow-ware. It gives a description of the materials used and explains the action and effect of each substance used. In short, it describes the whole of an intricate and little understood process in a very simple manner, yet true to detail, so that results can be had by following directions. A valuable book for any one interested in the subject.

ACCOUNTING EVERY BUSINESS MAN SHOULD KNOW. By E. E. Garrison. Size, 5¼ x 7½ inches; 188 pages. Price, $1.20. Doubleday, Page & Co., New York, 1910.

This book presents in a very simple and clear manner what to the average mind is a difficult and intricate subject, business accounting. There are fourteen chapters devoted to a description of the various forms of systematic bookkeeping incidental to everyday business.

It seems to us that the title of the book tells its object in the best possible manner, and it surely is a book that every business man should have.

PATTERN MAKING. By G. H. Willard. With chapters on Core Making and Molding, by F. D. Crawshaw, Assistant Dean, College of Engineering, University of Illinois. Size, 5¾ x 8¼ inches; 214 pages; 312 illustrations. Price, $1.00. Popular Mechanic Company, Chicago, Ill., 1910.

A book devoted to the principles of pattern and core making and molding. The illustrations are remarkably clear, and as clues to the text make every description readily understood by amateur and expert alike.

Just the book for the pattern-core maker and molder and also for the man starting in business, whether he has had former practical experience or not. The most expert cannot fail to find some new wrinkle in it and the beginner can become expert by following its directions.

For sale by THE METAL INDUSTRY.

THE MANUFACTURE OF LEAD AND COPPER ALLOYS.

To the Editor of THE METAL INDUSTRY:

I have been reading the articles relating to the patent controversy over bearing metals, as published in your paper with a great deal of interest. I was particularly interested in the claims made by the Andrew Allan & Sons Company and the Ajax Metal Company as to who should get credit for first discovering the secret of alloying copper and lead.

While I do not know when the first alloy was produced, I have been able to produce an alloy of upwards of 60 per cent. of lead with or without tin, using neither nickel nor bismuth for a number of years. While I have never had a chance to demonstrate my alloy except in piston rings, where it has given very good results, I still believe that there is a good future for this alloy for bearing metal on all high-speed machinery, and for your inspection you will find two samples cut from a cast ingot. Mark A contains 88 parts copper, 12 lead, tin trace. Mark O contains 60 parts copper, 40 parts lead and no tin, and I might make a dozen mixtures varying in their contents, but similar in their appearance.

I have never seen any of the metals spoken of in your paper, so do not know what they are. My results have all been obtained in trying to produce an absolutely anti-friction metal that will stand up under any pressure. A. P. WRIGHT.

Berkeley, Cal., Feb. 24, 1910.

[The Wright samples can be seen at the office of THE METAL INDUSTRY by any one interested in these bearing metals.—ED.]

THE MANUFACTURE OF PURE COPPER CASTINGS.

To the Editor of THE METAL INDUSTRY:

I have read the above article in your January issue with great interest, as one who is also exercised on the problem of maintaining the conductivity of copper castings made from ingot metal.

I should like, however, had Mr. Reardon been somewhat clearer in several of his explanations, and hope if possible to be enlightened upon several trade terms, used in the article, which are not readily understood in this country. First of all, I should like to say the standard for the conductivity of copper is taken relatively to silver being the highest, viz., 100 per cent., and, of course, reduces his percentages given. He proceeds to state the following: "After the copper was melted it was 'poled' with hickory poles to bring it to 'pitch' or reduce oxides." Does this mean sufficient carbon was added to the surface of the molten metal to counteract the oxygen, by this means? Also, what is the appearance of correct "pitch," and how do you tell density by testing in a vise?

Further, I would be glad to know, approximately, what he considers to be the critical temperature of copper before casting.

I may add that the rest of the article was extremely clever, and the results obtained for such large castings abundantly justify his practice, and have no doubt he can also prove satisfactory reason for the above. DANIEL MCPHAIL,

William McPhail & Sons,
8 Coemyss Place, Glasgow, Scotland.

February 21, 1910.

METALLURGY FOR JEWELERS.*

To the Editor of THE METAL INDUSTRY:

During the discussion of a paper bearing the above title, read by Mr. T. J. Mountford at a meeting of the Birmingham Metallurgical Society, the writer made a brief statement (concerning the quality of Swedish copper), which was so entirely misconstrued by the reporter in the October issue of THE METAL INDUSTRY, that it has been thought advisable to review the subject and correct the obvious error which crept into the printed report of that discussion.

Mr. Mountford remarked that perhaps the best form of copper which he had used for alloying with gold and silver was Swedish copper wire. He attributed its superiority to the fact, that it had received mechanical treatment, and, later, he extended his theory by suggesting that oxide in copper tended to produce a good ingot.

The president, Mr. Hiorns, threw out the suggestion that there might be an element present in Swedish copper, e. g., arsenic, which accounted for its superiority. The writer replied that he knew of no impurities contained in Swedish copper except traces of gold and silver, the very metals with which jewelers wished to alloy copper. He implied that it was the presence of the precious metals and the almost entire absence of other impurities, which made Swedish copper so valuable to jewelers. He further discouraged the idea that mechanical work "per se" could add any special alloying properties to the copper.

In substantiating these remarks, he would like to express the opinion that of all the common elements which would not improve copper for alloying purposes, oxygen and arsenic stand in the foremost rank, shoulder to shoulder with bismuth, antimony and sulphur, oxygen is not only desirable, but necessary, in commercial copper, but copper ingots or any form of copper intended for alloying purposes should contain the least possible percentage of this element, and, moreover, it behooves those who use copper in alloys, to melt their copper so that it will contain no dissolved oxide in liquid solution. This may be less necessary, perhaps, in the case of gold and silver alloys, than in the case of brasses and bronzes, where entangled oxides of zinc, iron, aluminum, or tin distribute themselves throughout the casting to cause porosity, or segregate mechanically to form areas of a "spilly" or spongy nature, thus impairing the strength of the alloy, or causing flaws, defects or ruptures, if the alloy be subsequently worked. Arsenic would harden and embrittle any alloy of copper with gold or silver and reduce its malleability and ductility. The same may be said of bismuth, antimony and sulphur; the latter, although of rare occurrence in anything more than harmless traces, may yet be found in electrolytic copper, having an electrical conductivity of over 101 per cent., in as high a proportion as 0.03 per cent. The presence of this element may possibly account for the inferiority of the brands of electrolytic copper, which did not meet with Mr. Mountford's approval.

Sulphur in electrolytic copper derives its origin from two sources, viz.: (1) the incomplete removal of the sulphate liquor in which the copper cathodes are deposited, and (2) sulphurous gases from the fuel of a reverberatory furnace being partially dissolved by the bath of molten metal as they pass over it on their way to the flue. It exists in copper mainly as cuprous sulphide, a highly dangerous and brittle constituent, and its presence in a gold and silver alloy would be very detrimental. The presence of bismuth and antimony should not be tolerated.

So jewelers should look for excellence in their copper more in its freedom from the above mentioned impurities than its contamination by them; and if a brand of copper contains, say, 0.05 per cent. silver (as some Swedish copper does), then they will be buying so much of the rarer metal for the price of the baser, and there will be a commercial advantage added to a technical one in the purchase thereof; a happy, but not too frequent combination of circumstances. F. JOHNSON.

Birmingham, England.

*THE METAL INDUSTRY, October, 1909.

Shop Problems

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE OF THE METAL INDUSTRY. ADDRESS THE METAL INDUSTRY.

ALLOYING

Q.—I would like to know how to make a metal of 80 per cent. copper and 20 per cent. lead.

A.—To prevent separation of lead in the alloy you name, nickel should be used. Add 1½ pounds of nickel to each 100 pounds of the mixture. The high melting point of the nickel causes the alloy to set very quickly and the lead is enmeshed and thus prevented from separating out.—J. L. J.

CASTING

Q.—We are trying to mold a brass bowl and are having very poor success. The side falls in as though it was a 'shut in." The bowl is for a spittoon top and weighs 7 pounds and is 5 inches deep, 10 inches across the top and ⅛-inch thick. Can you tell us how to proceed?

A.—For a casting of this kind it is best to use a mixture containing considerable lead. The following alloy will prove satisfactory:

Copper	83 parts
Tin	7 parts
Lead	4 parts
Zinc	6 parts

A high cope should be used so that when the metal is poured there will be pressure enough on the mold to drive out all the air and gas. The cores are best put in just before pouring and should be made of sea sand and glue water.—J. L. J.

CLEANING

Q.—Please publish a formula for an electro-cleaning bath.

A.—The electrical bath is arranged as follows: An iron tank is fitted with steam coils and connected with the positive current, then the tank is filled with warm water and to every gallon is added:

Caustic soda	6 ozs.
Sal soda	2 ozs.
Cyanide of potassium	¼ oz.

Bring this solution to nearly the boiling point, arrange a rod across the tank and connect with the negative current. The rod must be insulated from the tank, connected up with heavy copper wire or cable so as to carry as heavy a current as possible. Then immerse your articles on frames or in iron wire baskets, using as large a mesh as convenient, hang upon the negative pole for two or three minutes, when the work should be sufficiently clean. If much oil or grease is upon the article, pass through a good strong potash before immersing in the electro cleaner.—C. H. P.

Q.—We should like to know how to clean the white metal from the steel braces used in making cars and arms in casket hardware.

A.—The white metal alloy that you are using is probably antimonial lead, composed of lead 87 parts, antimony 13 parts. Strong nitric acid ought to remove it from steel articles without dissolving much of the steel. If the antimonial lead were removed from the articles in a regular sweating or white metal reducing furnace, little of it would remain on them and they would be free from dross or dirt. This would make the pickling operation simpler and require less acid, which is a desirable thing, as nitric acid is expensive.—J. L. J.

DIPPING

Q.—Please publish a formula for a bright dip on German silver.

A.—A good bright dip can be made as follows:

Yellow aqua fortis, 38%	2 gallons
Oil of vitriol 66%	1 gallon
Water	1 pint
Muriatic acid	½ ounce

Mix and allow to cool. After the cup has been in use for some time, add the acids in the proportion of 1½ parts of oil of vitriol and 1 part of aqua fortis.—C. H. P.

FINISHING

Q.—I should like to get a formula for a finish on brass hardware. It is used on car trimmings, is of a dirty gray color with brassy tints and is called old olive green finish.

A.—You probably refer to Flemish Brass, as this finish has a gray back ground with brass relief upon the high lights. The articles are usually lacquered with a lacquer that gives a slight greenish tint, usually prepared by adding a little aniline green dissolved in wood alcohol to the regular or brush lacquer.

To make this solution proceed as follows:

Prepare in old brass finish by any of the usual methods, then cleanse the articles in the usual manner, then immerse them in a hot solution, made as follows:

Muriatic Acid	2 ozs.
White Arsenic	1 oz.
Water	10 gal.
Sulphurette of Potassium	1 dwt.

In a few minutes immersion a dirty gray will be produced, then remove wash and dry out, remove the color from the relief portion with a small cloth buff wheel and pumic stone, running the wheel as slow as possible to avoid a bright effect, then dry out and lacquer as mentioned above.—C. H. P.

LACQUERING

Q.—Kindly advise through your paper what ingredients go to make up a water lacquer thinner.

A.—The so-called water lacquers are usually made from gum copal in a solvent of denatured alcohol, fusel oil and amyl acetate. So the thinner can consist of these three solvents, or a mixture of denatured alcohol and fusel oil, or amyl acetate and fusel oil in equal parts.—C. H. P.

LIQUATION

Q.—I am having trouble with screen plates by small buttons or nodules forming and dropping out of the plate, leaving pits. We recently changed our copper brand, and since then have had this trouble.

A.—The trouble you mention is due to liquation. The addition of one pound of 30% manganese copper to your mixture is recommended. The manganese will tend to set the metal before liquation can take place. It is suggested that the copper you formerly used may have contained arsenic (many brands of Lake copper do), and this arsenic prevented liquation.—J. L. J.

MIXING

Q.—We manufacture a metal ferrule which we desire to produce with red metal. We are using aluminum as a flux in the copper and zinc mixture and get a yellow color. What mixture must we use and what flux must we apply to produce a red color and make perfect castings? Our molds and cores are of green sand, and where we do not use aluminum the metal will not run down and fill the molds and make a perfect casting.

A.—The price at which ferrules are sold usually necessitates the use of a cheap yellow brass mixture in making them. In

order to get a red color and perfect castings, you can try the following mxture:

Copper	90 parts
Tin	7 parts
Zinc	2 parts
Lead	1 part

If the castings are shaken out while hot the surface will become oxidized and present a richer color.—J. L. J.

PLATING

Q.—My black nickel solution plates smoky. Can you tell me how to make it work bright? I use the regular arsenic bath.

A.—The trouble with your solution is that it contains too much water probably from constant use. To overcome your present difficulty proceed as follows:

Heat 1 or 2 gallons or more of muriatic acid on a hot water bath using the regular acid jar for the purpose, this should be accomplished out of doors, when the acid is as hot as possible to get it, add all the powdered white arsenic, that the acid will take up, usually from 2 to 2½ pounds to the gallon if the heat is maintained for same length of time. After preparing, add sufficient by test to produce a good clear deposit from your bath. You can use this method always, as it is not necessary to add any other ingredient after the bath is once prepared, to replenish the bath.—C. H. P.

Q.—I am using a mechanical plating apparatus with double nickel salts and curved anodes. How can I obtain a good bright finish?

A.—To increase the luster of nickel deposit add 2 or 3 ozs. of sal ammoniac to each gallon of solution, also add occasionally instead of the double salt 3 or 4 ozs. of single nickel salt to the gallon. In mechanical plating the solution must be maintained considerably more concentrated than in a still bath.

Q.—Am having trouble with new nickel solution just started. The first four loads were all right. Now work begins to peel. What do you consider the cause and what is the remedy?

A.—You do not state what your new metal bath is composed of. If you have used the old formula of ¾ pounds of the double nickel salts to the gallon, then you may expect trouble everytime with a new bath. A good formula should consist of the following:

Double nickel salts	8 ozs.
Single nickel salts	2 "
Sal ammoniac	2 "
Boracic acid	¼ oz.
Water	1 gal.

To remedy your present solution if it stands over 60 degs. reduce with water to 4½ or 5, saving the solution, then add two ounces of single salts and 2 ounces of sal ammoniac to each gallon of solution.—C. H. P.

Q.—My acid copper bath is plating rough and streaked. It is composed of carbonate of copper. Can you tell me how to remedy it?

A.—The formula for an acid copper bath that usually gives excellent results consists of, commercial sulphate of copper, 21 lbs.; water, 1 gal.; commercial sulphuric acid, 2 ozs.; yellow dextrine, ½ oz.

To prepare the bath dissolve the copper salt in as little boiling water as possible, then in the remaining portion add the sulphuric acid and mix well. It is advisable to mix the dextrine with a little boiling water, as it dissolves more readily. Use a current strength of 2 volts and anodes of soft sheet copper. You state you have made up your acid copper by the use of carbonate of copper, is your statement correct? If so, naturally you will not be able to produce results.—C. H. P.

Q.—I am troubled with a green copper carbonate deposit on my anodes in a cyanide copper solution. Can you tell me of some solvent that will not interfere with the conductivity of the solution?

A.—The trouble you are experiencing is due to the fact that your solution contains too much of the potassium salt and not enough free cyanide to maintain your anodes sufficiently clean while in constant operation. Hydrocyanic acid judiciously used would assist you to overcome this difficulty. Hydrocyanic acid neutralizes the carbonate of potassium formed by reciprocal decomposition by continuous heating, or constant operation of the solution, forming potassium cyanide in which, of course, the basic carbonate of copper or zinc noted upon your anodes is soluble in a slight excess of the same. Ammonia water is found very efficient for the purpose of keeping the anodes clean, either in brass or copper baths, but an excess must be avoided or other troubles will ensue. One-half ounce 26% ammonia added to each gallon of solution will probably overcome your trouble.

The following formula should give you a good yellow green verde:

Nitrate of copper	5 ozs.
Sal ammoniac	5 ozs.
Chloride of lime	5 ozs.
Water	1 to 2 gals.

Use the solution lukewarm, copper and slightly oxidize the surface for light tones; for dark tones oxidize the surface to a black. Some little experimenting may be necessary. Add only 1 gal. of water first to preparations given. If too strong and the oxidized surface is absorbed, add more water up to 2 gals. After the green has formed, it is oftentimes an advantage to immerse the articles in clean cold water as rapidly as possible, then allow to dry in the air. The verde is then deeper and richer. After drying, lacquer and wax in the usual manner.—C. H. P.

Q.—Kindly advise me how to nickel plate a few pieces of German silver, such as tea and coffee pots that have been silver plated.

A.—The formula for a nickel plating solution consists of the following:

Water	1	gal.
Double nickel salts	½	lb.
Single nickel salts	1½	ozs.
Boracic acid	¼	oz.

Dissolve the salts in boiling water in the order mentioned; then allow to become cold. The anodes should be of cast nickel. Two Bunsen cells of 3 quart capacity or one of 6 quarts will be most suitable for nickel plating. In plating German silver great care must be taken to have the articles perfectly clean; this, of course, is accomplished by using a strong solution of soda or a weak solution of potash. A good nickel deposit will look as well and wear better than silver, because it does not tarnish.—C. H. P.

SHRINKING

Q.—What can be done to prevent the cracking and shrinking of figures cast of zinc in slush molds?

A.—It is customary for the makers of statuettes, and other slush mold work that is liable to crack, to use the highest grade of zinc obtainable. We recommend you to try Horse-Head or Golden-Rod brand. If the cracking continues, you will have to make your core in several parts so that when the key is removed it will at once collapse and allow the casting to shrink freely.—J. L. J.

STRIPPING

Q.—Can Royal copper be stripped, and if so, how?

A.—Royal copper is readily soluble in a dilute sulphuric or muriatic acid or cyanide solution.—C. H. P.

SWEATING

Q.—Will you kindly tell us how to separate the white metal from steel braces using in casting of ears and arms for casket hardware?

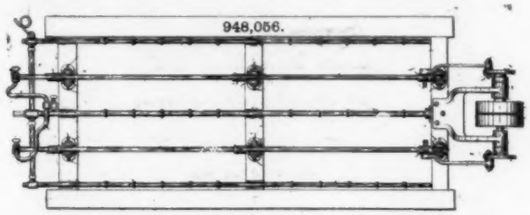
A.—The white metal that you are using is probably antimonial lead, composed of lead 87 parts, antimony 13 parts. Strong nitric acid ought to remove it from steel articles without dissolving much of the steel. If the antimonial lead were removed from the articles in a regular sweating or white metal reducing furnace, little of it would remain on them and they would be free from dross or dirt. This would make the pickling operation simpler and require less acid which is a desirable thing as nitric acid is expensive.—J. L. J.

PATENTS

REVIEW OF CURRENT PATENTS OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

948,056. February 1, 1910. Electroplating Apparatus. Willis R. King, Newark, N. J. Assignor to Hanson & Van Winkle Company, Newark, N. J.

This is a device for agitating the "work" or articles to be plated in a plating solution. It is well known that in the operation of electrolytic processes, that the rapidity with which plating or deposition of metal is accomplished depends ordinarily upon the strength or intensity of the electrical current used and the richness of the plating solution; but, it is also known that proper plating or deposition of metal can only be accomplished ordinarily by the use of but moderate current-intensity.

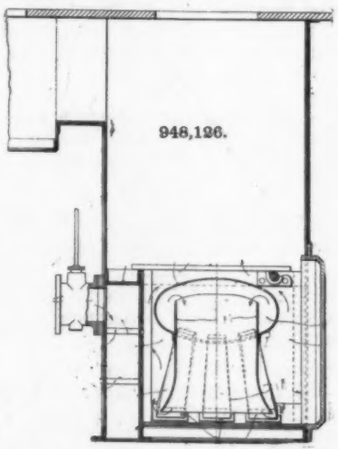


The principal object of this invention as shown in the cut is to provide a means for so agitating the "work" or articles to be plated within the plating solution, that an increased intensity of electric current may be safely used without danger of "burning" the work, whereby the plating process can be accomplished in a much shorter period of time than by means of the use of the ordinary plating apparatus.

A further object is to provide a novel arrangement and construction of agitating devices, whereby the "work" or articles to be plated are agitated within the plating solution with a wave-like motion, accompanied with slight jarring movements at intervals, whereby the air and hydrogen bubbles, which collect upon the "work" and interfere with and delay the deposition processes, are shaken or jarred off, thereby leaving the surfaces of the "work" free to receive the deposit of metal.

948,126. February 1, 1910. Furnace for Melting Metals and for Like Purposes. John C. Barker, Leeds, England.

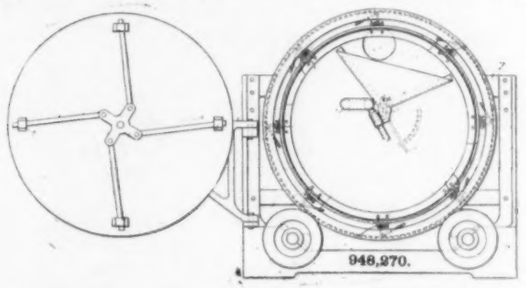
This is a furnace which is intended to be used for melting metals in crucibles. As shown in cut it is provided with an air blast which is applied to the furnace in such a way that the



air is pre-heated before it enters the fire box. Within the ash-pit and immediately below the grate there is an additional heating chamber consisting of a dome-shaped or elliptical casing which is coupled directly to the air inlets of the ash-pit by means of side connecting tubes or trunks, while depending from the said casing is a central tube or trunk having its lower end, which extends downward within the ash-pit, left open; so that the air blast, after traversing the chamber or chambers formed by the hollow wall or walls of the ash-pit, is delivered into the ash-pit side tubes or trunks which convey it into the casing where it is superheated, when the superheated air passes out of the said casing by way of the central depending tube or trunk into the ash-pit below the grate. The air supplied to the grate is thus brought to a highly heated condition, whereby a more beneficial result is obtained than in the case where the air blast is heated by merely traversing the chamber or chambers formed by the hollow wall or walls of the ash-pit.

948,270. February 1, 1910. Sand Blast Machine. Chas. A. Driesbach, New Haven, Conn.

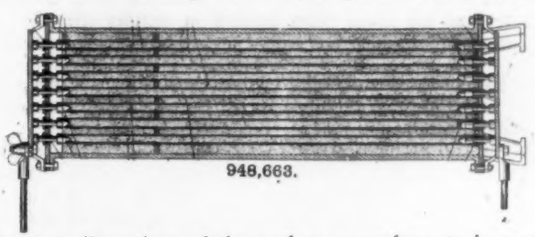
A sand blast machine which will permit of the treatment of small castings, etc., by tumbling while being acted upon by the sand blast. This is accomplished in the machine as shown in cut by employing a rotary drum in which the work is placed.



The drum has a stationary head which carries a sand trough. A series of blast nozzles communicate with the trough. An air blast pipe passes through the head of the drum and opens into the nozzles. A valve is used to control the supply of air and also of the sand to the nozzles.

948,663. February 8, 1910. Method of Coating Metals by Cementation. Alfred Sang, Bellevue, Pa.

An improved method for coating metals by cementation. The great drawback heretofore in coating metals by cementation has consisted in the fact that the coating metals, which are either in the form of a salt of the metal, an oxid, or an oxidized powder, are non-conductors, or extremely poor conductors, of both heat and electricity. This has made it difficult to get the heat through the coating metal and to get an even distribution



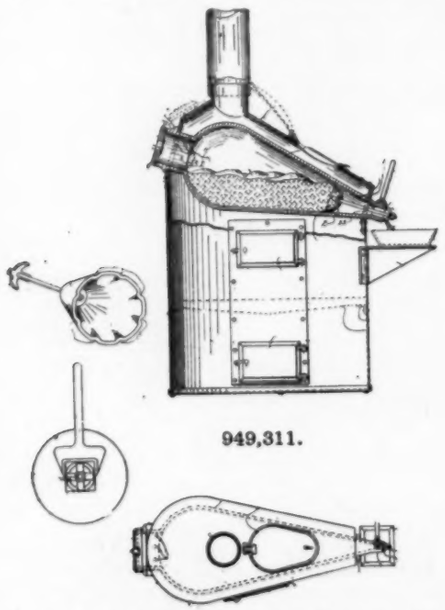
of heat at all portions of the surface or surfaces to be coated, except after a considerable period of time. The results, even where rotating drums and other means have been employed to facilitate the distribution of heat, have been very irregular. This method is designed to obviate these difficulties by overcoming the resistance of the coating material to the passage of heat and by providing a simple and efficient method whereby a proper heating action may be obtained.

By this process the articles to be treated are buried in the coating material, which is in the usual powdered form, and

when an oxid, or oxidized dust, is employed as the coating material a reducing agent, such as carbon or, better still, carbonic acid gas, is employed. If some other compound of the metal is used, suitable reagents are added, excepting when the heat alone will reduce the coating material to the proper condition. The articles are then heated by means of an electric current. This may be accomplished in the case of pipes, as shown in the accompanying cut. The pipes are supported at their ends by terminals which may be of conical form, and which pass through non-conducting heads, or non-conducting portions of the heads, of the retort, and which are connected with any suitable source of electric energy. The article or articles may be quickly brought to the necessary temperature to bring about the decomposition of the coating material and the deposition of the coating metal upon the article. This temperature will be substantially uniform throughout the extent of the article, thus insuring uniformity of result.

949,311. February 15, 1910. Dross Furnace. Geo. L. Kalker, Pueblo, Col. Assignor to Paragon Metals Company, New York.

This furnace is an improvement in dross furnaces and consists, as shown in cut, of a conical caldron inclosed within the walls of the furnace, in which heat is produced by either coal or gas, and in such manner that the caldron may be revolved on its ends, which are formed to serve as trunnions; and the objects of the improvement are, first, to provide a dross furnace for

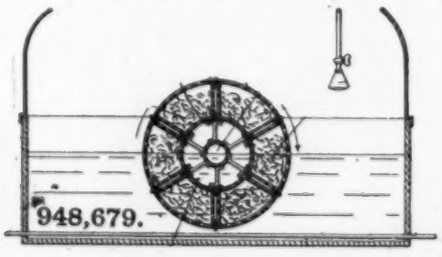


949,311.

melting dross of type metals, and, second, to provide a dross furnace that will require little space in which to operate the same, and that will utilize the heat in an economical manner; and, third, to provide a means of converting dross to metal, that will prevent the dross from coming in contact with the open air and thereby reduce the production of litharge to a minimum

948,679. February 8, 1910. Apparatus for Extracting Tin from Tin Plate Waste. Heinrich Brandenburg, Kempen-on-the-Rhine, Germany.

By means of the machine shown in the cut an energetic contact of the alkaline lye and air with the waste from which tin is to be extracted, is insured by a drum apparatus being constituted by two drums provided with perforated walls and

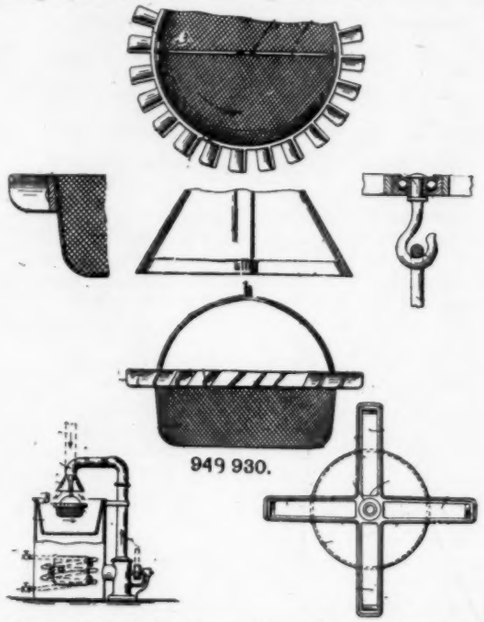


948,679.

arranged concentrically about a spindle, only the annular space inclosed between the said drums, being filled with tin containing products, so that only a comparatively thin layer has to be moistened and aired, while in the usual ordinary drums completely filled with the waste products, neither the alkali lye nor the air can be brought into a thorough contact with the waste. An efficient moistening with the lye and an efficient airing cannot be attained owing to the layer of the waste from which tin is to be extracted and which is moved in the drum, being much too thick to enable the air and the lye to come into thorough contact with each particle during the rotation of the drum.

949,930. February 22, 1910. Means Adapted for Drying Jewelry, Etc. Arthur W. Hutchins, Cranston, R. I.

In the usual way of "drying-off" finished and unfinished jewelry, etc., the articles are placed in heated sawdust, the result being to absorb the moisture from them. Such former method consumes a comparatively long time, several minutes at least, and frequently leaves the surfaces of the articles in a stained or discolored condition, together with the presence of adhering dust and foreign matter which necessitates a subsequent cleaning or brushing operation for removing the same.



949 930.

In order to obviate the above difficulties the apparatus shown in cut has been devised. By its means the washed articles are thoroughly dried in a few seconds, thereby effecting a considerable saving of time; the articles or "work" are in no wise discolored or soiled during the drying operation, and may be shipped without additional handling.

The apparatus consists of a basket or container adapted to be disposed with respect to an air-blast which acts upon the basket and causes the latter to rotate rapidly, thereby quickly drying off the surfaces of the wet or washed articles or work, as articles of jewelry, contained in the basket.

947,836. February 1, 1910. Bedstead. M. G. Merriett, Rome, N. Y. Assignor to Rome Metallic Bedstead Company, Rome, N. Y.

947,983. February 1, 1910. Purifying Tantalum. Ezechial Weintraub, Schenectady, N. Y. Assignor to General Electric Company, New York.

948,288. February 1, 1910. Mold for Hollow Castings. Wm. T. Bausmith, Bellevue, Kentucky. Assignor to Victor Safe and Lock Company, Cincinnati, Ohio.

948,316. February 8, 1910. Journal Brass. F. J. Fenning, Nashua, N. H.

948,528. February 8, 1910. Molding Flask. Chas D. Smith, Dayton, Ohio.

948,975. February 8, 1910. Molding Machine Counterbalance. C. M. Huggins, Philadelphia, Pa.

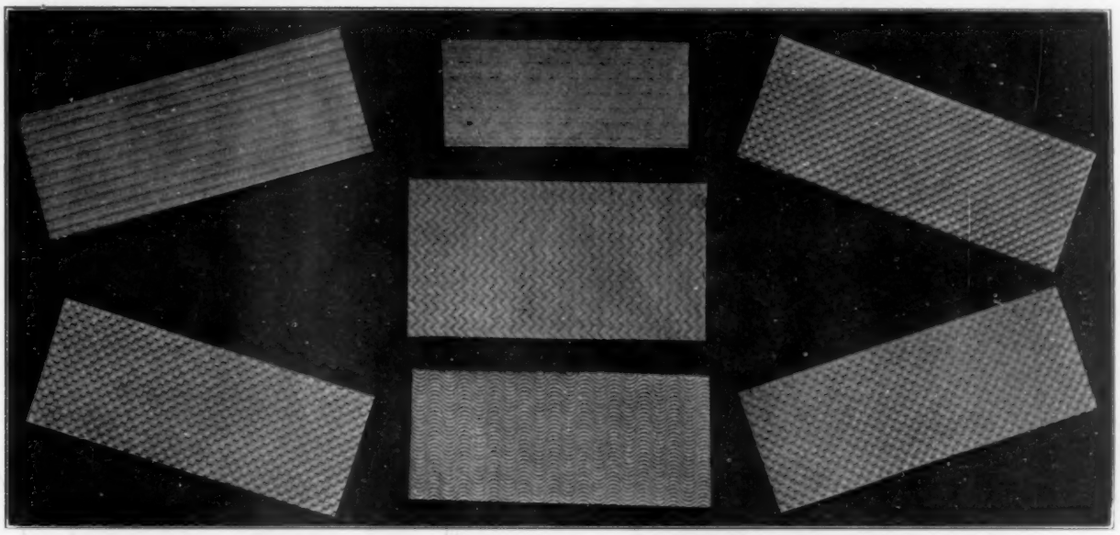
INDUSTRIAL

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

NEW APPLICATIONS OF SHEET ZINC.

FANCY ROLLED METAL PRODUCTS.

The National Sheet Metal Company, of Peru, Ill., besides being extensive manufacturers of plated sheet metals, zinc glaziers' points and metal sash bars, are now putting on the market sheet zinc rolled in fancy designs. This metal is rolled by means of specially-designed rolls and is adapted for die work and stamping. The metal is so rolled that stamping it will not in any way mar the design on the sheet, as will be seen in Fig. 2 of an ash tray made by the new process. The cut Fig. 1 shows some of the designs rolled upon the metal.



FANCY ROLLED DESIGNS ON ZINC, BRASS AND ALUMINUM.

Some of the forms in which this fancy rolled metal is produced in are: Nickel zinc or nickelene, which is adapted for many uses. The surface is highly polished nickel, and as brilliantly reflective as a mirror. All the articles that are now stamped or pressed out of zinc, brass, tin and plated in pieces, can be stamped or pressed out of this metal. No plating to be done after the operation, which means an immense saving of labor and money.

It is used extensively for clock besels and cases, crumb trays, comb cases, soap dishes, match safes, bath tubs, ice boxes, stove trimmings, metal signs, kitchen cabinets, regalia trimmings, etc. As the base metal being zinc, there is not the least danger that the edges will ever rust. It can be bent to a sharp angle without cracking, and pressed into various shapes and forms.

BRASSENE, which can be profitably used in the manufacture of many articles now made of solid brass. It is sheet zinc, brass plated and highly polished.

COPPERENE, or sheet zinc, copper plated, can be substituted for pure copper in many cases for fancy goods, button backs, etc. It also takes a high polish and is a great deal cheaper than copper. and answer the same purpose for articles not exposed to the weather.

BRONZENE has the appearance of bronze polished to a bright finish, and can be generally used in place of bronze for a great many articles of fancy design now made of bronze.

NICKEL TIN is simply tin with a nickel surface. The base is steel, and can be used extensively by the trade in manufacture of articles where the surface must be excedingly bright and attractive. This is the same with Brasstin and Coppertin, which belong to the same class.

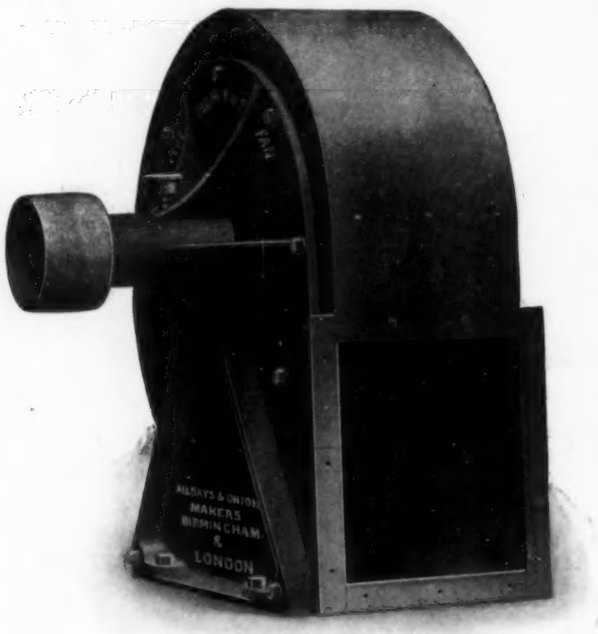
The National Sheet Metal Company also manufacture double-plated metal which shows copper oxide on the back of sheet, protecting the metal from corrosion. The process of single plating metals, omitting the copperization, in use by some, is an old method, which, because it affected their quality and durability, was either entirely abandoned or used only for the lower grades. Single plated metal shows on back of sheet only natural zinc, having nothing to protect the metal.

Any one interested in these new metals or any of the products of this company is invited to write for samples and to ask for pamphlet H.

FANCY ROLLED AND STAMPED ZINC.

THE VENTILATION OF WORKSHOPS IN THE METAL TRADE.

The regulations which have come into force this year for the proper ventilation of workshops in the brass trade are looked upon, by a great many firms, as unnecessary, and which will have a tendency to increase cost of production, with the consequent loss of trade, when in competition with foreign firms. Ventilation has generally been considered a fad, not required, therefore any money spent on ventilating machinery is necessarily wasted, as they see no apparent interest for their money. It used to be, and is now, with some, that plenty of smoke, fumes, etc., are essential for the appearance of being busy, but this is very erroneous, as the human being is capable of doing more work per hour, and also for a greater number of hours per day, when breathing pure air, than when breathing impure and stagnant air. It is a fact well known among employers that the output of work during the last part of the day's work is not nearly so great as during the first. This is not solely due to the cause of being tired, etc., but because the atmosphere is impure; this being more pronounced in the winter months, when during a great part of the afternoon the "gases" are lit, thus causing many impurities in the atmosphere. This applies to all trades, but especially to brass-casting, where the fumes given off by the metal when being poured, etc., are very harmful to breathe.



CENTRIFUGAL FAN WITH DUST-PROOF BALL BEARINGS.

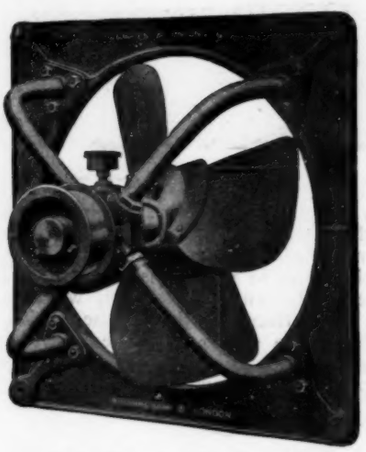
The human frame may be aptly compared to a steam engine. If an engine is designed to work at 100 pounds pressure, and it is only supplied with steam at 75 pounds, the output of the engine in power is decreased by 25 per cent. No business man would permit this in his work, if he required the full power his engine was capable of producing. The human body is exactly the same, being designed to use a certain quantity of oxygen in the air, but if the oxygen supply is restricted in any way, as it is in impure air, the person is not capable of producing its maximum output, hence it is important, if only looked at from the production point of view, that the employees should work under the best conditions possible, and all money spent on this attainment, such as ventilating machinery, is just as necessary as money spent on improved machinery for the actual mechanical production. Probably there is no need to argue the point, for it seems very obvious. So much, then, for the economic aspect of ventilation. How to secure it with economy and efficiency is the next thing. With this, as with everything else, the cheapest way in the long run is to place the matter in the hands of a good firm, who knows how to do it properly.

Ventilation may be split up into two heads, general and local. General ventilation means the ventilation of a workshop as a whole, and local ventilation means dealing with the impure air, or material, such as dust or fumes, at their source of origin. In small shops open windows are usually sufficient (if there are no processes giving off noxious gases) where feasible. When not feasible for one reason or another, roof ventilators may be used and suitable air inlets provided. It is no use having an outlet unless means of admission for the fresh air are provided and well distributed. The trouble with automatic ventilation is that it is more efficient on a windy day, than on a hot, calm day, when most needed.

If automatic means are not possible or sufficient, the fan remains as the alternative and for large shops is the only possible method of securing an adequate supply of fresh air.

In polishing shops, etc., when considerable dust is raised it is naturally better to trap the dust at its source of origin, if possible, or locally. This is true for all processes which generate dust, of course, but it is not always possible. Dust removing is one of the most, if not the most, difficult problems connected with ventilation, and it does not follow that any one who is good at making the ducts can design them in correct proportions and shape. Care requires to be exercised as to the type of fan used, propeller or centrifugal, and as to the size most economical for the purpose. There are many plants in Birmingham which are taking double, and more than double, the power which would be sufficient were the ducts and fan properly designed.

A propeller fan is very like a ship's propeller in appearance and there is a general consensus of opinion nowadays among fan exerts that the open bladed fan with few blades is better than a fan having closed blades six or eight in number. A centrifugal fan usually works in a casing, and is suitable for working against a resistance, whereas a propeller fan is *not* suitable for working against any but the very slightest resistance or practically with open inlet and discharge. Good examples of modern fan design are illustrated (Figs. 1 and 2) on this page, the centrifugal fan having dust-proof ball bearings.



PROPELLER TYPE OF FAN.

One point is most important if economical running is to be obtained. Under no consideration should a fan be too small for its work. If it is it will have to run quicker; and adding 30 per cent. to the speed will take more than double the power which would be sufficient if a suitable fan were used. The type to be used depends upon the arrangement of the shop, and in polishing shops, a propeller fan will give, perhaps, the best results if it be possible to adopt this type. Unfortunately, unless there is room for a comparatively large duct it is not efficient, owing to the resistance caused. A centrifugal fan must then be used; but both types require considerable skill in application, both as to the size and disposition of the ducts, and as to the shape of the hood to trap the dust. It is not sufficient to have the

best fan; it must be applied in a scientific manner or disaster is likely to ensue.

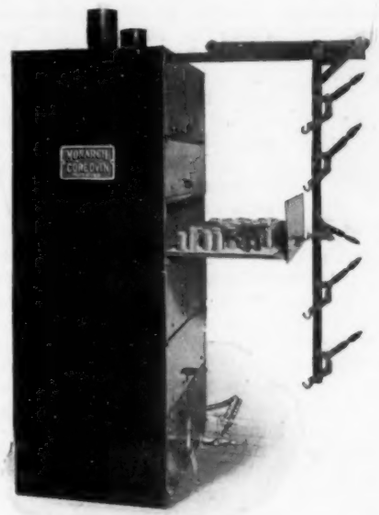
The problem of the moment is the removing fumes from brass casting shops, and it promises to be in some cases difficult but not insuperable. One trouble encountered is caused by the workmen themselves, for, working piece work as is usual, they are disinclined to use any means which require a particle of their time to arrange. The same difficulty for that matter is encountered in all trades, and has to be taken into account. The usual practice is to range the boxes round the spilling benches, and to carry the pots from one box to another. If it be feasible, and no doubt in many shops it is, to use a "tilting" furnace, the boxes could be taken to the furnace with beneficial effects in several directions. Certainly the dense fumes could be more easily confined and removed, smaller hoods and ducts being required, thus materially reducing the cost.

Using fans and hoods it will, in almost every case, be possible to connect several shops to the one fan, and the general effect upon the shop generally, especially in summer time, cannot help but be beneficial even when not pouring. Draughts, if the inlets for fresh air are suitable, will not be a source of trouble and need not be feared; but the doorway must not be the only means of inlet.

When noxious fumes are given off, as in plating shops and the dipping of brass goods in acids, it is not a difficult matter to secure breathable air in the shop for little cost, and the propeller fan suitably installed will be found the better type to use.

MONARCH "ACME" PORTABLE CORE OVEN.

This latest type of core oven, as shown in the accompanying illustration, is now being manufactured and placed on the market by The Monarch Engineering and Manufacturing Company of Baltimore, Md. It is of the distinctive portable type, and can be fired with oil or gas, coal or coke. It is equipped with five rectangular portable shelves, permitting the use of the entire area of space within the oven for the baking of the cores. The doors can be drawn out all together or independently of one another, and it is to be especially noted that the oven is practically closed by the sheet steel shutters which form the back of the shelves.



MONARCH CORE OVEN.

These shutters are so arranged as to prevent the escape of the heat if perchance the tray is drawn out for receiving or discharging cores. The core oven is equipped with an overhead trolley arrangement which is automatic. The oven is vented with two large diameter pipes at the top. The standard size is 2 x 3 x 6 ins., and the manufacturers are prepared to furnish these ovens of this special type in various sizes as may be ordered. They can be arranged in batteries of 4 to 6, side to side, or back to back. Prompt shipments are promised, and prices guaranteed. A large number of these ovens have been placed in the various representative foundries, both home and abroad. Further information may be had by sending for Catalogue T. M. I.—4.

CLEANING OF METAL WORK.*

When one considers the large variety of metals that are to be cleaned, such as iron, steel, brass, bronze, britannia, aluminum, soft metal, zinc, tin plate, silver plate, nickel plate, etc., and when also one considers the large number of materials to be removed, such as vegetable, animal and mineral oils, buffing compositions of all kinds, made up with a large variety of binders, it can be readily seen that it would be impossible to clean all classes of work with the maximum efficiency and economy with a few cleaners. Nevertheless this is what has been really attempted by a number of concerns who have hitherto handled this end of the business. The more progressive manufacturers have, therefore, been compelled to do a lot of experimenting, adopting that material which has given them the best results. This, of course, does not necessarily mean that the ideal cleaner for that particular class of work was adopted.

The International Chemical Company is the first concern in the United States and probably in the world who have changed this practise. They have developed a complete line of cleaner's particularly adapted to the preparing of all kinds of metal work before plating, tinning, galvanizing, dipping, jappaning, etc. Instead of following the old method of selling people just what they ask for, or recommending the same article for a large variety of work, they always make a special effort to induce the customer to give them all the details concerning the nature and class of work they clean, so that the company's expert can study carefully each case and make such changes as to methods and materials as will improve their conditions and reduce their expense.

Summing up the entire situation it is fair to say that the careful study of the proper cleaners and methods of taking care of metal work of all kinds preliminary to plating, dipping, lacquering, japanning, tinning, etc., is one that has been greatly neglected and one upon which there is considerable room for improvement. It seems that the most logical way to take up this matter would be for manufacturing concerns to get in touch with those who make a special study of these operations, as well as those who have had considerable experience and who are in a position to make definite recommendations as to the proper materials to be used. This would prevent them from being compelled to try out all those things which may be recommended to have some merit. It is for this reason that the International Chemical Company has specialized on this line of work. They feel that their manufacturing a complete line of materials adapted to cleaning of metal work and their system of giving expert advice is filling a long-felt want.

INDEPENDENT PUMP HYDRAULIC JACK.

It is sometimes inconvenient to work the lever of a jack of the internal pump type because of the lack of room, or insufficient footing. There are other places where only a short space is available to place the jack—another condition which cannot be met successfully with the ordinary inside pump jack. This is especially true in bridge, ship and dry dock work, etc. Even in more common work it is sometimes to the operator's advantage, in the way of getting a better footing, more power, or safety, to be at a considerable distance away from the jack.

To meet those conditions the Watson-Stillman Company put upon the market an independent pump hydraulic jack which they furnish in 53 sizes of from 2 to 1,200 tons capacity. The various sizes of the jack proper have maximum ram movements of from 4 to 8 inches. The pump is connected to the jack by means of flexible copper tubing, which may be of any length suitable to the work in question. The jack may be operated up to a pressure of 450 pounds per square inch on the ram by means of the hand lever shown on the pump, and further worked to full capacity by means of the extension lever. The gauge may read in pounds per square inch, or in tons load upon the jack, or both.

*Abstract from an address by S. D. Bencliel, General Manager of the International Chemical Company, Camden, N. J., at the dinner of the National Electroplaters' Association, held in New York City, January 16th. The technical part of the address was published in the February number of THE METAL INDUSTRY.

Associations and Societies

DIRECTORY OF AND REPORTS OF THE PROCEEDINGS OF THE METAL TRADES ORGANIZATIONS.

AMERICAN BRASS FOUNDERS' ASSOCIATION.

President, Wm. R. Webster, Bridgeport, Conn.; Secretary and Treasurer, W. M. Corse. All correspondence should be addressed to the Secretary, W. M. Corse, 1155 Sycamore street, Buffalo, N. Y. The objects of the Association are for the educational welfare of the metal industry. Annual convention with the American Foundrymen's Association in a succession of cities, as invited. The next convention will be held in Detroit, Mich., June, 1910.

Secretary Corse, in writing from Buffalo, says: "I have the following new members to report as having joined the association: Prof. S. W. Parr, University of Illinois, Urbana, Ills.; Charles E. Foster, Rochester, N. Y.; Charles H. Marsland, Rome, N. Y. I was in Detroit recently and found the arrangements for the convention progressing nicely. The hotel accommodations in Detroit are going to be heavily taxed during the coming summer, and I would advise those who expect to attend to reserve their rooms well in advance. The copies of the abstracts relating to non-ferrous metallurgy, taken from the abstract journal of the American Chemical Society, are off the press and will be distributed shortly. They cover a period of from July 1, 1909, to February 1, 1910, and contain various articles of interest. I hope this addition to our transactions will prove of decided value."

THE FOUNDRY AND MANUFACTURERS' SUPPLY ASSOCIATION.

President, F. N. Perkins, Freeport, Ill.; Secretary, C. E. Hoyt, Lewis Institute, Chicago, Ill.; Treasurer, J. S. McCormick, J. S. McCormick Co., Pittsburg, Pa. All correspondence should be addressed to the Secretary, C. E. Hoyt, Lewis Institute, Chicago, Ill. The objects of the Association are for the commercial and technical education of iron and metal industries by co-operating with all foundry and manufacturing interests in making an annual exhibit of supplies and equipments in conjunction with the meeting of the American Foundrymen's Association. The next exhibit and convention will be held in Detroit, Mich., June 6-10, 1910.

Secretary Hoyt reports that the next annual exhibit and convention will be held in Detroit, June 6 to 10, 1910. The location will be at the Michigan State Fair Grounds and the association will occupy the main, horticultural, administration and probably one or more temporary buildings. They are looking forward to a record-breaking success. Thus far they have had inquiries for more space than the total amount used at Cincinnati last year. Mr. Hoyt expects in a few days to be able to send out plans of available space for exhibitors.

NATIONAL ASSOCIATION OF BRASS MANUFACTURERS.

..President, Theo, Ahrens, Louisville, Ky.; Commissioner, William M. Webster, Chicago, Ill. All correspondence should be addressed to the Commissioner, William .M. Webster, 1112 Schiller Theater Building, Chicago, Ill. The objects of the Association are to promote in all lawful ways the interests of firms engaged in the manufacture of brass goods. Meets every three months. Each meeting fixes the place and date of the meeting to follow, consequently there is no stated place. It has been customary for the Association to hold its Annual Meeting in New York City in December of each year. The Semi-Annual Meeting is generally held at Atlantic City or some other Sea Coast town. The next meeting will be held in Cleveland, O., on March 16 and 17.

Commissioner Webster reports that the spring meeting will be held March 17, 1910, at The Hotel Hollenden, Cleveland, O. A number of applications for membership will be acted upon and other matters of interest to the brass trade will be taken up.

NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION.

President, Frederick A. Grier, Cincinnati, Ohio; Treasurer, W. P. Davis, Rochester, N. Y.; Secretary, Chas. E. Hildreth, Worcester, Mass. The objects of the Association are to promote the interests of the machine tool builders in the direction of good fellowship and the liberal discussion of subjects relating to the improvement, standardization of parts and methods of manufacturing machine tools. The Association meets at the call of the Executive Committee. Annual meeting held in New York City. Semi-annual meeting selected by the Association. Correspondence should be addressed to the Secretary, Chas. E. Hildreth, Worcester, Mass.

The convention of this Association will be held May 24 and 25, 1910, at Hotel Seneca, Rochester, N. Y.

NATIONAL ELECTROPLATERS' ASSOCIATION OF THE UNITED STATES AND CANADA.

President, Chas. H. Proctor, Arlington, N. J.; Treasurer, Nathan S. Emery, New York, N. Y.; Secretary pro tem., Percy S. Brown. All correspondence should be addressed to the Secretary, P. S. Brown, 956 Anderson avenue, New York. The objects of the Association are to promote the dissemination of knowledge concerning the art of electro-deposition of metals in all its branches. Meets the first Saturday of each month, 8 p. m., at the Hotel Chelsea, 222 West Twenty-third street, New York City.

The thirteenth regular meeting was held at the Hotel Chelsea, 222 West 23rd street, New York, Saturday, March 5, 1910. Thirty-three members were present, and a number of applications for membership were received. Nine new active members were elected, bringing the total membership up to 84. The meeting was given up to the discussion of the revision of the constitution and by-laws and to the reading and discussion of papers. Geo. B. Hogaboom read an article from an English paper relating to "Galvanit," a powder that plated tin, nickel, silver or cadmium by merely rubbing it on the metal under treatment. Considerable discussion followed the reading. Mr. Hogaboom also read a compilation of formulas taken from trade journals for the past five years. These formulas related to the oxidizing of copper, brass, iron, etc., and considerable interest was shown in the list. The constitution in its proposed revised form is published on the next page. It will be voted upon at the annual meeting, which takes place in May. The out-of-town members are requested to read over the constitution carefully and send in to the secretary any suggestion they may see fit.

PUBLICITY FOR PLATERS.

". . . . The thing to remember, however, is that success will not come to even the chemist plater unless he realizes that to attain success he must put behind him all the old ideas and distribute his knowledge freely to others."—Percy S. Brown in speech at Platers' dinner January 15, 1910.

PROPOSED REVISION OF CONSTITUTION AND BY-LAWS OF THE NATIONAL ELECTRO-PLATERS' ASSOCIATION TO BE VOTED UPON AT THE ANNUAL MEETING IN MAY, 1910.

ARTICLE 1.—NAME, OBJECT AND LOCATION.

SECTION 1.—The name of the association will be The National Electro-Platers' Association of the United States and Canada.

SEC. 2.—The object of this association shall be the advancing and dissemination of knowledge concerning the art of electro-deposition of metals in all its branches, and to maintain an Employment Bureau for the benefit of the members and the trade at large. A Bureau of Information and a laboratory equipped for research work will be maintained by the association and meetings will be held for the purpose of presenting papers upon appropriate subjects, as well as by the publication of such literature as may be deemed advisable.

SEC. 3.—The location of the headquarters of this association shall be New York City.

ARTICLE 2.—MEMBERSHIP.

SECTION 1.—The membership of the association shall consist of three classes to be called respectively: Active, Associate and Honorary.

SEC. 2.—Active Members—These shall consist of Foremen Electro-Platers and Electro-Chemists.

SEC. 3.—Associate Members—These shall consist of representatives of supply houses directly interested in electro-plating in its different branches.

SEC. 4.—Honorary Members—These shall consist of any person whose knowledge or services would be pre-eminently valuable to the association.

SEC. 5.—Membership Badge—The button and ensigna adopted by the association in July, 1909, shall be the official badge.

ARTICLE 3.—OFFICERS.

SECTION 1.—The officers of this association shall be a President and ten Vice-Presidents, a Recording Secretary, a Corresponding and Financial Secretary, a Treasurer, a Librarian, a Sergeant-at-Arms, an Assistant Sergeant-at-Arms and a Board of Trustees which shall consist of five members, three of whom must be electro-platers.

SEC. 2.—The ten Vice-Presidents shall be elected from their respective sections as follows:

(A) New York; (B) New Jersey; (C) Connecticut; (D) the New England States, except Connecticut; (E) Pennsylvania, Delaware, Maryland, District of Columbia, Virginia, West Virginia; (F) Illinois, Michigan, Ohio, Indiana; (G) Missouri, Kansas, Colorado, New Mexico, Utah, Arizona, Nevada, California; (H) Wisconsin, Minnesota, Iowa, North Dakota, South Dakota, Idaho, Nebraska, Montana, Wyoming, Washington, Oregon; (I) North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, Texas, Kentucky, Tennessee, Indian Territory; (J) Canada.

ARTICLE 4.—CONVENTIONS.

SECTION 1.—This association shall meet in convention each year at the time and place that the members may decide upon at the previous annual convention.

SEC. 2.—During the convention, meetings shall be held for the transaction of business and for the purpose described in Article 1, Section 2 and for the exhibition of all paraphernalia used in the art of electro-deposition and finishing of metals.

SEC. 3.—Seven members shall constitute a quorum.

ARTICLE 5.—DUTIES OF OFFICERS.

SECTION 1.—It shall be the duty of the President to preside at all meetings of the association, to preserve order, to put all motions before the meeting if duly seconded, to decide all questions of order subject to an appeal to the meeting and give the casting vote in case of a tie, and shall in honor of his office be a member of all committees. He shall have power to reprimand a member for unbecoming conduct during the time of meeting; he shall at all meetings call the attention of the association to such subjects as he may think worthy of their consideration; he shall appoint all committees not otherwise provided for and in the absence of an officer he shall appoint a member to act during his absence; he shall call the First Vice-President to his chair during the discussion of any question before the meeting on which he may desire to speak; he shall adminster obligations to new members and perform such other duties as may be prescribed by the laws.

SEC. 2.—Vice-President's Duties.—The First Vice-President shall perform the duties of the President in the absence of the latter. The District Vice-Presidents shall act as Chairman of all meetings held in their respective sections and shall act in conjunction with the Board of Trustees in regard to the qualification of all applicants for membership residing in their respective districts. In the absence of a Vice-President a chairman *pro-tempore* shall be elected.

SEC. 3.—The Recording Secretary shall keep an accurate report of the proceedings of each meeting, which shall be recorded in a book kept for that purpose. He shall attend each meeting, if possible, and immediately after the opening thereof call the roll of officers, noting the absentees and read the minutes of the preceding meeting or meetings which have not been confirmed. He shall read all propositions for membership and enter a brief and distinct statement thereof, together with the action taken thereon in the minutes and records of the proceedings of the meeting. He shall take charge of all papers and documents appertaining to his office and shall also keep an itemized account of the receipts and expenses of each meeting.

SEC. 4.—Corresponding and Financial Secretary.—He shall notify all members the time and place of the next regular meeting or any special meeting; shall attend to all correspondence of the association and be in charge of the Employment Bureau. He shall keep a complete register of the name and residence of each member, showing when he was admitted and when he resigned or discontinued membership. He shall forward a copy of all applications for membership to the Chairman of the Board of Trustees, also to the Vice-President of the district in which said applicant resides as soon as said application is received. He shall receive all moneys in behalf of the association and enter the same in books provided for that purpose and give receipts for the money so paid; he shall at the end of each meeting pay over all moneys to the Treasurer, taking a receipt thereof. He shall also read an itemized account of the receipts and expenses of each meeting and make a quarterly report.

SEC. 5.—The Treasurer shall take charge of all the funds of the association and pay all bills properly presented to him for payment. He shall deposit the funds in such a manner as the association may provide, and the Board of Trustees shall have supervision over such deposits. He shall be required to furnish the necessary bonds, the securing of which shall be paid from the funds of the association. He shall attend all meetings, if possible, and receive at the close of each meeting all moneys paid to the association and give a receipt thereof. He shall have his accounts correctly posted and ready for examination every quarter or whenever required to do so. In the event of the Treasurer being unable to attend any meeting he shall designate such member of the association as he desires and appoints to receive the money in his behalf; shall make a quarterly report and a final one at the end of his official term.

SEC. 6.—Librarian.—He shall provide a suitable subject for discussion for each meeting; shall keep a record of the results of such discussions and preserve all papers presented before the association. He shall attend to the editing and publication of whatever matter the association may desire to publish. He shall have charge of all literature, magazines, books, etc., that may be possessed by the association. He shall make at the annual convention a report on the conditions and progress of the art of electro-deposition.

SEC. 7.—Sergeant-at-Arms.—He shall prevent, as much as possible, all noise and disturbance caused by persons coming in, and allow no persons to leave the room before adjournment without permission of the President; also he shall prevent the admission of any person who is not a member of the association. He shall at all times execute the commands of the President.

SEC. 8.—Assistant Sergeant-at-Arms.—He shall perform the duties of the Sergeant-at-Arms in his absence.

SEC. 9.—The Board of Trustees (none of whom shall hold any other office), shall have a general supervision over the funds and property of the association, they shall constitute a standing committee for the consideration of matters that may be referred to them by the President, such matters shall be determined by the Board of Trustees in accordance with the Constitution and By-Laws, and must be ratified by the association. They shall also investigate all applications for membership.

SEC. 10.—Every officer holding property of any kind belonging to the association shall deliver up the same after his successor has been chosen or at any time the association may require it.

SEC. 11.—Every officer at the end of his official term shall present a report of all his official transactions, or if he should resign before the expiration of his term he shall present such report with his resignation.

SEC. 12.—Any officer intending to resign shall give a written notice of the same at least one month previous to his resignation which resignation shall be acted upon when presented and his successor elected by the association.

SEC. 13.—If any officer absents himself from two successive regular meetings without an acceptable excuse, such office may on motion and by a majority vote of members present be declared vacant and an election immediately held to fill the vacancy.

ARTICLE 6.

SECTION 1.—All officers of the association shall be elective and the term shall be for one year.

SEC. 2.—The election of officers shall take place at the annual meeting. It shall be by secret ballot of blanket form.

SEC. 3.—Should there be more than one candidate for any office, the candidate receiving the majority of the votes cast shall be declared elected. Should there be no choice on the first ballot, the candidate receiving the least number of votes shall be dropped and another vote taken. This shall be continued on each ballot, until one of the candidates receives a majority of votes cast.

SEC.—4.—At each election the President shall appoint two (2) tellers and an inspector who shall count the votes and declare the result, whereupon the President shall announce the name of the member elected.

ARTICLE 7.

SECTION 1.—Installation of Officers shall take place at the first regular meeting after the annual meeting. No member shall be installed into any office who is not in good financial standing.

ARTICLE 8.—MEMBERSHIP.

SECTION 1.—All applications shall be made to the Secretary on a special form furnished by him, this form to be filled out as directed and endorsed by the applicant and present or former employer and a member (in good standing) of the association.

SEC. 2.—Applicant shall receive a copy of the Constitution and By-Laws which he shall be expected to read attentively as he will not be allowed to plead ignorance for any violation. He must also make the affirmation before the association.

ARTICLE 9.—DUTIES OF MEMBERS.

SECTION 1.—All members of the association must assist any other member (in good standing) in whatsoever manner he may be able to do.

SEC. 2.—Every active member of the association must vote when requested to do so, except when excused by the President.

SEC. 3.—Every active member shall have equal part or voice in property or concern thereof.

SEC. 4.—Any member changing his place of residence must notify the Corresponding and Financial Secretary of his new address within thirty days after such removal. Membership tickets will be renewed upon presentation.

SEC. 5.—Any member losing or damaging or destroying any part of the property of the association shall make good at his own expense.

ARTICLE 10.—MEETINGS.

SECTION 1.—The regular meeting of the association shall be held on the first Saturday of each month, unless changed by a two-third vote of members present at a previous meeting.

SEC. 2.—Special meetings may be called by the President, or by the request of seven members and due notice given.

ARTICLE 11.

SECTION 1.—The following committees shall be appointed by the President: Printing Committee, who shall have charge of all printing for the association.

SEC. 2.—Information Bureau Committee shall consist of seven (7) members, the Corresponding Secretary and the Librarian being members of the committee and shall answer all queries of members in good standing and keep a record of all questions and answers for the future welfare of the members of the association.

SEC. 3.—All committees shall report one month after appointment and such report shall be made in writing and signed by said committee or majority thereof to be filed with the Recording Secretary.

ARTICLE 12.

SECTION 1.—No part of this Constitution shall be repealed, altered, annulled, suspended or amended unless a proposal in writing be submitted to

the association at least two (2) months prior to the consideration of such proposal.* All members not present may vote by proxy on a regular authorized form.

BY-LAWS.

ARTICLE 1.—ORDER OF BUSINESS.

Rule 1.—Calling the roll of officers, recording those present and absent.
Rule 2.—Reading the minutes of the previous meeting.
Rule 3.—Applications for membership.
Rule 4.—Balloting for candidates.
Rule 5.—Communications, bills, etc.
Rule 6.—Report of Standing and Special Committees or officers.
Rule 7.—Unfinished business.
Rule 8.—New business.
Rule 9.—Reading receipts and expenses for the evening.
Rule 10.—Good and welfare.
Rule 11.—Adjournment.

ARTICLE 2.

SECTION 1.—Any member wishing to resign his membership shall present a written resignation to the Recording Secretary who shall read the same when in order, provided that such resignation be signed by the Corresponding and Financial Secretary.

ARTICLE 3.

SECTION 1.—At the first regular meeting of each second quarter the Board of Trustees shall report to the association the names of the members who are indebted to the amount of three months' dues, when the association shall take action thereon.

ARTICLE 4.—DUES.

SECTION 1.—The annual dues for active members shall be $5 per year and for associate members $3 per year.

SEC. 2.—Members whose dues are not paid within three months after the adjournment of the annual meeting shall be considered in arrears.

SEC. 3.—Only members who are not in arrears shall be considered members in good standing.

SEC. 4.—No dues shall be collected from honorary members.

SEC. 5.—Members whose dues for the previous year remain unpaid at the beginning of any fiscal year shall be dropped. Dropped members may be re-instated upon application, accompanied by a remittance of all moneys due the association, unless by unanimous vote of the association. All such applications shall, however, be subject to the approval of the Board of Trustees.

SEC. 6.—The membership fee shall be $1, to be accompanied with the application.

SEC. 7.—The fiscal year shall be divided into four quarters. Any applicant on being elected a member shall pay dues for the current quarter and remaining quarters of the fiscal year in advance.

ARTICLE 5.—OFFICIAL ORGANS.

SECTION 1.—THE METAL INDUSTRY and Brass World shall be requested to act as the organs of the association until such time as the association can maintain an official organ of its own.

ARTICLE 6.—GRANTING OF CHARTERS.

SECTION 1.—Any body of Foremen Electro-Platers and Electro-Chemists wishing to organize a branch association of the National Electro-Platers' Association may do so upon application to the National Electro-Platers' Association for a charter. The President shall not grant a charter to any body unless said application has been approved by a two-thirds vote of the active members of the association. Any applicant who is already a member of the National Electro-Platers' Association shall not be permitted to vote upon said application.

SEC. 2.—All branch associations shall pay the sum of not less than ten per cent. of all moneys received for the dues as a per capita tax to support the National Electro-Platers' Association.

*Such proposal shall take place only at the annual meeting.

ARTICLE 7.—RULES OF ORDER.

First.—The President, or in his absence the Vice-President shall take the chair and call the meeting to order. In the absence of these officers a president *pro tempore* shall be chosen by the association.

Second.—The President shall be privileged to debate on all subjects on calling the Vice-President or any other member to the chair.

Third.—After the meeting has been called to order each member shall take a seat, which he will be required to keep during the evening and must not interrupt the proceedings by reading or conversation without permission of the President.

Fourth.—When a member desires to speak on a question, make or second a motion, he shall rise from his seat and respectfully address his remarks to the chair, confine himself to the question and avoid personalities. Should more than one member rise to speak at the same time, the President shall determine who is entitled to the floor.

Fifth.—A member shall not be interrupted while speaking, except for the purpose of explanation or upon a call to order.

Sixth.—When a member is called to order he shall sit down and await the decision of the chair which shall be received without debate.

Seventh.—A member shall not speak more than once upon the same subject or question until all who wish to speak have had an opportunity, or more than twice without permission of the President.

Eighth.—The mover of a motion shall be at liberty to accept any amendment thereto, but if an amendment be offered and not accepted, yet duly seconded, the association shall pass upon it before voting on the original motion.

Ninth.—Any member may call for a division of the question when the sense of the same will admit it, but a motion to strike out or insert shall not be permitted unless with the consent of the mover.

Tenth.—A motion shall not be subject to debate unless it has been seconded and stated from the chair.

Eleventh.—When a question is under debate no motion shall be in order, except to lay on the table, for the previous question, to postpone for a certain time, to postpone indefinitely, to refer to a committee, to substitute, to amend, which motions shall have precedence in the order herein arranged and the first two shall be decided without debate.

Twelfth.—No motion for re-consideration shall be received unless made by a member who voted in the majority in the first instance and made before the expiration of the next regular meeting.

Thirteenth.—On a call of one-third of the members present, the yeas and nays shall be ordered. On the yeas and nays being called, each member shall vote and their names and votes shall be recorded upon the minutes of the meeting.

Fourteenth.—No question shall be permitted to go to vote that can be decided by law.

Fifteenth.—Before taking the vote on any question, the President shall ask: Are you ready for the question? Should no one offer to speak the President shall rise and put the question. After he has arisen no member shall speak upon it without the President's permission.

Sixteenth.—The member first named on a committee shall act as chairman until one be chosen by the committee from its members, and a mover of a resolution referred to special committee is the first named thereon.

Seventeenth.—No committee shall be discharged until all debts contracted by them have been paid.

Eighteenth.—The motion to adjourn shall not be in order during the order of business.

Nineteenth.—After the order of business a motion to adjourn is always in order, except when another motion is before the association.

Twentieth.—In all questions of parliamentary law not included by these By-Laws or Rules of Order, Cushing's Manual of Parliamentary Practice shall be considered as authority.

Twenty-first.—Upon adoption of this Constitution and By-Laws, all laws previously adopted shall be considered null and void.

CHARLES H. PROCTOR; *ex-officio*,
GEORGE B. HOGABOOM,
HUGH BAXTER,
AUGUST HOFFMAN,
A. D. HAVENS,
ROYAL F. CLARK, Chairman of Committee.

ITEMS OF INTEREST TO THE INDIVIDUAL.

The address of Percy S. Brown, secretary of the National Electro-Platers' Association, is now 956 Anderson avenue, New York City.

Ira D. Garman, of Philadelphia, a silversmith, has become an active leader in reform politics, and is on the reform ticket as candidate for Select Council.

A. C. Hobson, superintendent of the Barbour Silver Company, Meriden, Conn., expects to start shortly on a trip abroad on business and pleasure combined.

T. E. Eichstaedt has gone to Detroit, Mich., temporarily to demonstrate as a specialist the Universal polishing wheel, manufactured by The Hanson and Van Winkle Company, of Newark, N. J.

John H. Way, purchasing agent for the Waterbury Clock Company, of Waterbury, Conn., has resigned after a service of 28 years. It is reported that Mr. Way will remove shortly to Denver, Colo.

Chas. S. Barbour, Jr., has gone to Rockford, Ill., to take charge of the plating department for the Rockford Silver Plate Company, manufacturers of high grade silver and britannia hollowware for retail jewelers.

Harry Hoover, a former well-known foundry foreman, has accepted a position with the S. Obermayer Company, manufacturers of foundry facings, supplies and equipment, and will look after the interests of the Obermayer Company in Buffalo and Dunkirk, N. Y.

G. J. Marcy, superintendent of the brass rolling mill of E. Miller & Co., Meriden, Conn., fell recently and broke his ankle. Mr. Marcy was for a number of years superintendent of the brass rolling mill of the Rome Brass and Copper Company at Rome, N. Y., and is well-known in the brass business.

E. J. Shaw has been elected president of the Detroit Brass Works, Detroit, Mich., to succeed Wm. A. Frazer, who died recently at St. Augustine, Fla. This concern employs about 400 hands and is one of the most prosperous and growing industries of Detroit. Mr. Shaw has been connected with the Detroit Brass Works for the past 11 years.

L. Cohen, formerly connected with the Sterling Smelting Company, has become identified with The Maxwell Metal Reduction Company, School street, off Borden avenue, Long Island City, New York, as president and general manager. Milton P. Kahn has been appointed general purchasing and sales manager. Mr Cohen reports that his company is increasing its capacity by the erection of a modern and up-to-date smelting and refining works, which will soon be completed.

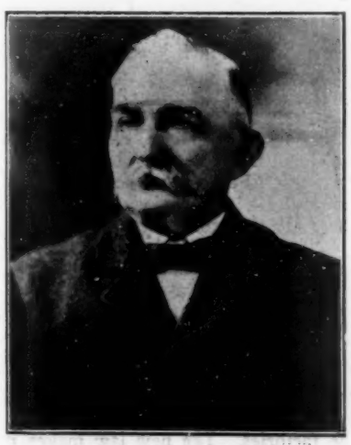
Dr. Richard Moldenke, of Watchung, N. J., secretary of the American Foundrymen's Association, has just returned from a trip abroad. Dr. Moldenke has been investigating a new method for caring for metal chips, both brass and iron, and may speak upon the subject at the Foundrymen's Convention to be held in Detroit, June 6-10, 1910. While in Europe, Dr. Moldenke took up the question of specifications for foundry pig iron, with a view of bringing European practice more in accord with our American way of doing things, the idea being that when this material is to be imported, it can be used as we handle our own iron.

It is not generally known that Mr. E. T. Stotesbury of Philadelphia, of the firm of J. P. Morgan & Company, Drexel & Company, and the many allied concerns of the house of Morgan is the most active manager of the Keystone Watch Case Company of which concern he is vice-president. Mr. Stotesbury is an officer of sixty or more corporations and, of course, pays but little if any attention to some of them, but the Keystone Watch Case Company is a hobby with him and, figuratively, he rings in on the time clock every day. He is personally familiar with every branch of the work, makes a personal examination of the summarized reports and keeps in touch with every branch of this great metal using concern.

DEATHS

AMBROSE H. WELLS.

Ambrose H. Wells, founder and president of A. H. Wells & Company, Waterbury, Conn., died at his home February 15, after a short illness. In addition to his connection with the company that bears his name Mr. Wells at the time of his death was president of the Waterbury Rolling Mills, Inc., a director of the Manufacturers National Bank, president of the Waterbury Battery Company and a director of the Elm City Brass and Rivet Company. He was also interested in a number of land companies. He was one of the Democratic members of the present Board of Public Works, of Waterbury, and was a prominent mason, having been a member of King Solomon Lodge, of Woodbury.



AMBROSE H. WELLS.

Mr. Wells was born at Newton, Fairfield County, Connecticut on March 26, 1837. He received his education in the schools of Newtown and worked on a farm, later learning the blacksmith's trade.

In 1862 he went to Waterbury, entered the employ of Brown Brothers, the predecessors of the Randolph-Clowes Company and became foreman of their tube mill. After 10 years with the company he retired and established a hay and feed business in Waterbury, which he sold two years later, returning to the mill he was formerly connected with, which had meanwhile passed into the hands of Randolph & Clowes, to take the position of superintendent.

In 1887 Mr. Wells started a factory of his own for the manufacture of small tubing. His expert knowledge of the business made this product come into demand at once, and Mr. Wells soon had a thriving business. His first little factory on the Watertown Road, containing only 400 square feet of floor space, was gradually enlarged to meet the demands of his growing trade until at the present time it rivals in size and equipment any other plant in the United States that makes a specialty of small sizes of seamless tubing.

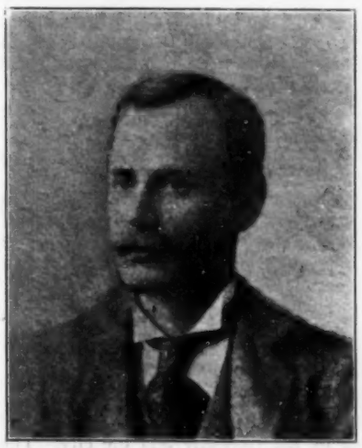
In commenting on the death of Mr. Wells, the Waterbury American says: "He inaugurated the manufacture of seamless tubing of small sizes for special purposes, when it was being somewhat overlooked by the big mills, and made a specialty of it. His venture was a success financially for himself. But more than that it established in Waterbury a first-class industry that might easily have drifted elsewhere. Thus, Mr. Wells contributed his part to building up the town. In politics, he was a man of recognized standing and character, who well filled the places of public service to which he was called. He was the type of citizen that no town can afford to lose."

Besides his widow, Mr. Wells leaves five sons, Samuel J., Frank A., George H., Edward H., and Clifford H., all active in the business established by their father.

RICHARD J. ASHWORTH.

Richard J. Ashworth, treasurer and manager of the Waterbury Manufacturing Company and an influential citizen of Waterbury, Conn., died at his Watertown home March 5. Early in February Mr. Ashworth was attacked by an acute stomach trouble and the strain of undergoing two operations only a few weeks apart in an effort to obtain relief, proved too great and he succumbed.

Mr. Ashworth was born in East Granby, July 5, 1857, the son of Thomas and Hannah Ashworth, who came from Halifax, Eng., and finally settled in Forestville, where Mr. Ashworth's boyhood was spent, his father being an expert manufacturer of fine wire. Early in 1879, the son came to Waterbury to enter the employ of the Waterbury Manufacturing Company. With this concern he has been associated for 31 years, rising from his original place of bookkeeper of the little company through various grades of responsibility to become the treasurer and manager of the present great corporation. He served as a director of the company, being also a director of the Chase Rolling Mill Company, the Chase Corporation and the Waterville Corporation.



R. J. ASHWORTH.
From a photograph taken some years ago.

Mr. Ashworth was a man of unusual business ability, both in administration and in judgment, of absolute loyalty to those whom he trusted, of a noticeable modesty of demeanor. Gifted with a keen sense of humor and with a kindliness responsive to all proper appeals for assistance, he walked his way independently, caring nothing for mere popular tokens of favor and seeking first of all the approval of himself and of his close associates. He has been closely and usefully identified with Watertown interests; he was a vestryman of Christ Church and responded, as in every relation of life, to all the demands thus placed upon him; he did all he could to promote the varied work of the Village Improvement Society and was actively interested in the Tennis Association. He continued his membership in the Waterbury Club, in which he was a familiar figure. He was also a stockholder in the County Club. On May 6, 1899, he married at Roxbury, Mass., Mrs. Alida Grace (Burritt) Fogg. There survives besides the widow one son, Harold Chase Ashworth.

Robert H. Winterbottom, a prominent Mason and employee of the Benedict & Burnham Company, Waterbury, Conn., died recently, from gas asphyxiation. He was found dying in Masonic Hall under circumstances indicating suicidal intent.

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS IN THE DIFFERENT INDUSTRIAL CENTERS OF THE WORLD.

BRIDGEPORT, CONN.

MARCH 10, 1910.

Business during the past month has continued at the same high level that ushered in the new year. All the large manufacturers are enthusiastic for the future, some of them having large advance orders, that will take many months to fill. The expansion in outside markets, and especially in foreign countries, for the products of Bridgeport concerns, is a notable feature of the past few months.

Bridgeport will have its share in the building of the Panama Canal, as the big valves controlling the water in the canal locks were made by the workmen at the West End plant of the Crane Valve Company, and the last of the twenty-four massive 60-inch "wedge gate" valves to be used in this work, has been shipped. These valves are about the largest manufactured, and can only be turned out by a concern with all the requisite facilities for making them. That they are large and strong is shown by the fact that each weighs between eight and one-half and nine tons, and only two can be shipped at a time on an ordinary flat car. But this is not the only work shipped from Bridgeport for this canal, as much of similar supplies has been furnished the canal people for the past three years.

Similar valves to the above have been supplied to the Seattle and Meriden water companies. Some of these valves can be opened and closed by hand, but as a rule, where quick service is required, they are fitted with gears to be operated by a motor.

This concern is constantly expanding, as, in addition to maintaining thirty-two branch offices and selling agencies in Germany, Austria and France, they have recently opened a branch office in St. Petersburg. They also ship many large valves to South Africa for use in factory work there.

Evidence of the optimism on the part of the manufacturers is the construction of additional buildings, improvement of shipping facilities, etc.

The Bridgeport Brass Company is doing a rushing business, and in looking to an outlet on the water front, have made overtures to the city of Bridgeport for the erection of a dock, and the filling in of the slip, owned by the company and the city. The company will agree to fill in the slip at its own expense, and build a wharf there for the city, about 140 fet long, if the city will grant it the use of the slip after it is filled in.

A building permit has been granted the Bryant Electric Company for the erection of a brick factory building, on the east side of Hancock avenue, to enlarge the facilities of the plant. The new building will be 60 by 147 feet, three stories in height, of the usual mill construction, and will be used when completed as a packing house and storage rooms for the finished goods. Another permit was granted the same company for the erection of a smoke stack, with the intention of altering and improving the power plant of the factory.

The Union Metallic Cartridge Company has just completed the construction of a shot tower of immense size. From 15 to 20 tons of shot, perfect in character as could be desired, were made in the new tower, on its first trial. The initial try-out was attended by many officials of the company. The successful test was in pleasing contrast to other trial tests of shot towers, when it required days of tests in order to make perfect shot.

With the commencement of the manufacture of the Bianca moving picture camera, by the American Graphophone Company, and the fact that the concern is admirably equipped to engage in this class of trade, it appears reasonable to believe that Bridgeport may soon become the center of the manufacture of a large amount of the apparatus that is used in the presentation of moving pictures.

Although this industry has been established but a few years, it has made rapid strides, until today there are tens of thousands of machines in operation all over the world, depicting real and imaginary events with marvelous accuracy. Its use is not merely confined to the amusement enterprise, but is fast being introduced into the commercial and educational fields.

A great advantage that Bridgeport will obtain if moving picture apparatus should be manufactured here, is that it may lead to the establishment of several other concerns which hold special patent rights.

Labor conditions in this city are ideal at the present time. The men seem contented, and amicable relations between employer and employee exist everywhere.

The State of Connecticut has selected Bridgeport as the location for one of its three trade schools. This new school has the encouragement of the Bridgeport Board of Trade, Business Men's Association, and Manufacturers' Association.

They have secured the services of Jeremiah Holmes, who has done a wonderful work in the training of young men in the Young Men's Christian Association's trade schools for some years.

The Bridgeport Trade School Association, Inc., was incorporated Feb. 10, 1910, to erect and maintain trade schools, etc. Capital stock, $20,000, divided into 800 shares, of $255 each. They will commence business with $1,000. The incorporators are Fred. Enos, F. W. Bolande, both of Bridgeport, and E. P. Bullard, Jr., of Stratford.

The establishment of this trade school is one of the chief topics of interest at present. Quarters have been secured, and it will begin work in a short time.—E. L. H.

PROVIDENCE, R. I.

MARCH 10, 1910.

The spring trade has brought disappointment to the larger portion of the manufacturing jewelers of this city and vicinity. A canvass among the jewelers brings an almost unanimous expression of opinion that the trade has not been up to expectations.

It had been expected from the earlier conditions of the trade that the amount of business this year would be of a banner type and would leave most of the past high records considerably behind. The spring had advanced only a little way, however, when the orders began to slacken up and in many places business has already fallen flat.

The business lassitude extends to practically all classes of the jewelry industry, although here and there can be found an institution which is doing a big business. Few of the factories are in this class. The spring is naturally a dull period for the gold goods manufacturers, and these say that conditions are about as in former years.

Business is expected to be rather dull from now on until the orders begin to come in for the early fall goods. The manufacturers will now turn their attention to getting out their fall samples. The salesmen will take out the new samples in May and June, and the first fall orders may be expected soon afterward.

The operation of the new 56-hour bill has been without any especial effect on the jewelry industry thus far, because of the lack of heavy business in the factories. The new law makes it unlawful for women and minors to be employed more than 56 hours in any one week. The passage of the law has not met with favor among the manufacturers generally, but no protest of an organized character has been made.

The jewelers believe that the first protest against the new law will come from the women and children employes themselves next fall when the usual period of over-time work sets in. This year this class of employees will not be able to work overtime because of the new law and will consequently be unable to make as high wages as in former years. This condition is expected not only to forestall efforts to secure the passage of the 54-hour bill over which there has been much talk, but also to start a movement on the part of the working people themselves to

have the law amended in some form so as to except jewelry workers from the provisions of the act.

An event of interest to the local manufacturing jewelers is the establishment in this city of a plant to manufacture imitation precious stones. The significance of the establishment of such an industry here can be appreciated when it is considered that of the total foreign importations subject to duty received annually at the Providence Customs House, more than one-quarter of the duties paid are for imitation precious stones, thousands of which are annually used by the manufacturing jewelers of this city and the Attleboros.

One of the greatest advantages of such an industry here is that in the future it will not be necessary for local maanufacturers to order large invoices of the goods from Europe, as they will be able to secure small orders filled immediately at the local factory. The stones are to be manufactured by Tannenbaum & Company, who have a temporary plant at 234 Chestnut street. The firm has under consideration plans for the erection of a new factory of suitable proportions.

The annual banquet of the New England Manufacturing Jewelers' & Silversmiths' Association will take place at Infantry Hall on the evening of Monday, March 21. President Taft will be the guest of honor. It is expected that the dinner will be the most elaborate event in the organization's history. Because of the small size of the hall he number of tickets has been limited to about 800, and these have sold for $15. Representative Harry Cutler, of this city, formerly president of the association and a member of the Cutler Jewelry Company, will act as toastmaster He will be introduced by President George H. Holmes.

In addition to President Taft, the speakers will be Senator Nelson W. Aldrich, Senator George Peabody Wetmore, Governor Aram J. Pothier and Mayor Henry Fletcher. So far as is known, this is the first trade dinner to be attended by President Taft, and it is expected that he will say something of interest upon the subject of the country's industries.

The jewelers are watching with interest the efforts of the Grand Trunk Railway to secure an entrance into Providence. The road has petitioned the General Assembly for a charter, and announces that it will positively build a road to this city if a charter is granted. The differential rates which the road gives to the West has greatly interested local manufacturers in the project, and nearly every municipal, business and civic organization in the State has indorsed the project.—E. S. U.

PHILADELPHIA, PA.

MARCH 10, 1910.

The first general strike called in America caused thousands of organized mechanics to drop their tools at midnight March 4. The half-holiday following prevented anything like an accurate count of the number of men joining in the general strike and at this writing the labor estimate is "more than 100,000," while Mayor Reyburn and Henry Clay, the Director of Public Safety, fix the number at "less than 20,000."

The Metal Polishers Union as well as all other trades identified with the organized labor movement were expected to respond to the call for a general sympathy strike, but a canvas of the larger establishments disclosed the fact that the great majority remained loyal to their employers and not one mill or factory employing metal workers was forced to shut down.

The general strike was called in sympathy with the striking employees of the Philadelphia Rapid Transit Company who felt called upon to inaugurate a strike to determine whether or not two unions might deal with the same employer. No question affecting either wages or hours figures in this strike. It is simply a demand for the recognition of a National Union only to the exclusion of a Local Union. The officers of the Rapid Transit Company have always been willing to treat with both unions or with any other body of men comprised solely of their own employees but refused to destroy the Local Union in the interest of the National Union. As a result of this action on the part of the Transit Company the members of the National Union were called out on strike sixteen days ago. More than one half of all the cars in the city are running. The loss to the Company thus far exceeds $1,000,000; the loss to the strikers cannot be computed for the reason that no reliable data is at hand indicating the number of men on strike.

The War Department has ordered two detachments of the regular army to prepare for action in Philadelphia to stand guard over the United States Mint. Riots are of hourly occurrence and business in the mill districts is at a standstill.

The local jobbers in the jewelry trade have perfected an organization which will undertake the publication of a trade journal devoted exclusively to the territory within 100 miles of Philadelphia with which to reach the retail trade more directly and to foster a more intimate friendship between the local jobbers.

An application has been made for a Charter for the Post-Graduate School of Dentistry of Philadelphia. This institution will be the first of its kind in Pennsylvania and its aim will be to conduct experiments in the use of aluminum and other metals and to perfect devices for the more satisfactory use of metals in dentistry as well as to teach the higher branches of dental ceramics. More than 100 students have already been enrolled and it is expected that very large quantities of the metals and alloys used in dental practice will be used by those attending this institution of which Dr. Albert Wade Jarman will be the directing head.

Dr. Frederic Poole, the celebrated lecturer on China and the Chinese, returned to Philadelphia last week and directed attention to a most curious financial problem having to do with the vast increase in the use of copper and brass in China which he traces to the antiquated, cumbersome and costly fiscal system of that country. Disscussing the general subject of coinage, metals and finance in China Doctor Poole said: "Within the past four years the value of silver bullion has decreased about one-third in the markets of the world. As a result of this depreciation there has been confusion in China not possible in any other country in the world and a corresponding increase in the use of copper, brass and silver which metals form the basis of all currency in China. The burden of this confusion falls on the man lowest down whose earning power has not received even a nominal increase during the same period Today it takes 1,800 of his copper cash to equal a tael in value, where, four years ago, 1,100 would make that measure. Converting this through lower silver into gold, the working chinaman must scrape together 3,300 copper cash to buy the value of one gold dollar in cloth. Four years ago he needed but 1,400 cash for such a purchase. Counterfeiting has been conducted on a gigantic scale and an edict has gone forth condemning counterfeiters to death and whole issues of coin have been confiscated because of spurious coins being found mixed with genuine."

William J. Kerns, formerly Assistant Director of the Department of Health, appeared before Coroner Ford on March 3 and identified the body of a man who died in the almshouse on October 6, 1909, as that of William Smith who once owned and operated a large brass foundry in this city. The body has been disinterred from Potters Field and will be given proper burial under the direction of Mr. Kerns who has had it placed in a vault.

Application has been made for a Charter for the Gara, McGinley Company by H. Clark Gara, Ellen C. McGinley and John T. Garraty. This company will conduct an extensive metal roofing business and all allied branches of metal work. This concern is now one of the largest consumers of copper roofing material in the country.

Primo Lulli, of Brussels, Belgium, gave a series of most interesting experiments in the use of exogen gas as a metal solvent during a brief stay in this city. He softened large blocks of armor plate, welded copper and aluminum and other metals and deeply impressed all who witnessed the tests made at the plant of the Midvale Steel Company. He was accompanied by Clarence R. Falk, of the American Oxhydric Company of Milwaukee, Wis.—C. H. C.

CLEVELAND, OHIO.

MARCH 10, 1910.

With the reopening of the building industry the big manufacturers of plumbing goods note a distinct revival in the call from the jobbers and wholesalers for their goods. They look for a banner season this year as the volume of building throughout the entire country promises to break all records. Scarcely a building of any character is now built which does not use

plumbing goods in one form or other. The manufacturers here are turning out novelties every year in addition to the regular stock patterns. Cleveland does not make tubs and such fixtures, but confines itself to the brass and copper end of the industry.

Two automobile shows are being held in Cleveland this year—one by the dealers and the other by the manufacturers. Both are great successes. One is over, it having been held during the last week in February. The other is just starting. Scores of splendid looking models, resplendent in nickel and polished brass are attracting immense crowds bent on investigating their merits. The auto plants here are as busy as can be and are working to capacity. Extentions are being put up in every direction and business is growing by leaps and bounds.

A week or two ago the big White Auto Company held a Saturday afternoon reception which was attended by hundreds of society folk. They were shown through the entire plant and everything explained to them.

The Peerless Auto Company took out another permit during the past month for a $40,000 addition to its plant. This will provide for another large building in the group being built on Quincy avenue near East 93d street.

Assignments were made by two concerns interested in the metal business one day late last month. The Ranney, Love and Hall Company, art metal dealers assigned for $2,000. F. W. Yennie, the assignee said that the assets were $800. The Lakeview Tin and Furnace Company, also assigned. H. I. Emerson, assignee, reported the assets at $1,000 and the liabilities the same.

The Lake Shore and Michigan Southern railroad, announces that, among other improvements to be made this summer, a new copper metal furnace to cost several thousand dollars is to be installed at the company's big repair plant at Collinwood, now a part of Cleveland.

The Forest City Engineering Company, of Cleveland, is erecting a new 120 by 250 building for the Aluminum Casting Company at Buffalo. A number of the sub-contracts are being executed by Cleveland firms.

The Aluminum Sign Company, of Kewaunee, Wis., has filed in federal court here an intervening petition asking for $2,529 against the Municipal Traction Company as a balance due for 1,500,000 aluminum three cent discs for use in the pay enter street cars here. The street car company has been in the hands of receivers and this was simply to insure a claim. The lines have been turned over to the original company again, which has stopped the use of the discs for the time being. They will be used again as soon as all outsanding ones are collected.

The Comstock Wellman Bronze Company of this city is having a new $20,000 factory erected for its use at Superior avenue and East 60th street. It will be of brick and reinforced concrete.—S. L. M.

DETROIT, MICH.

MARCH 10, 1910.

Representative metal men are now busily engaged making preparations for the coming national convention of the American Foundrymen's Association and the allied organizations, the American Brass Foundrymen's Association, the Fondry and Manufacturers' Supply Association, and the Associated Foundry Foremen, which will be held in Detroit beginning June 6 and continuing until June 10. The fact that something like ten thousand foundry executives are coming from all sections of the United States and Canada is significant enough in itself. Unquestionably the exhibit of mechanical equipment on which so large an outlay is made, accounts for the great outpouring expected, but the technical session of the convention also claims a large interest for those attending. The commercial consideration makes a strong appeal, and it is true that any exhibit that can show the proprietor or the superintendent how he can save money is a first-class attraction. The excellent work done by the American Foundrymen's Association with the accumulative influence it has exerted, has been the exciting cause. The association has marked the lines of advance and mechanical invention has met the need.

Early in April ground will be broken for a new $100,000 plant for the National Fulton Brass Manufacturing Company. It will be located just east of the Detroit Steel Products buildings on the Grand Boulevard, a frontage of 294 feet having been purchased. The new plant will be as artistic as possible and consist of a number of well lighted buildings.

The officers chosen at the annual meeting of the National Fulton Company a few days ago are: President, John F. Harrigan; vice-president, Frank E. Beal; secretary-treasurer, A. J. Skiffington; directors, H. H. Hewitt, New York; C. M. Hewitt, Chicago; and the officers.

Mr. H. H. Hewitt, who attended the meeting, is one of the leading brass manufacturers of the country. He is very enthusiastic regarding the future and declares that nothing can stop the progress of the country but Congress. He declares that it would be a great blessing if Congress would adjourn for ten years and give the United States a rest.

F. O. Becker, superintendent of the Western Railway Weighing and Inspecting Bureau, has sent a communication to the Detroit Board of Commerce in which he says that claims against the railroads for overcharge are due in a great measure to improper and imcompetent description of articles such as brass and other castings. Castings (N. O. S.) as from mold, except being cleaned and drilled with holes and dipped to preserve from rust, not machine finished packed in boxes, barrels or casks, are in the fourth class, while castings, machine finished packed in boxes are in the second class. There are also other castings provided for in the classification at different ratings. The shipping ticket should plainly describe the casting, he declares, and thus a great amount of misunderstanding will be avoided.

The Michigan Brass and Foundry Company suffered a small fire recently, causing a loss of $500. It resulted in but little inconvenience and the damage has been repaired.

At the recent annual meeting of the Michigan Copper and Brass Company, a resolution was adopted to increase the capital stock $200,000, preference in the sale being given present shareholders. The board of directors was increased from nine to eleven members by the addition of George H. Barbour, Jr., and William A. Livingstone. There are sufficient orders on hand to keep the plant running a long time; new orders are also constantly coming in.

The Muzzy Lyons Company, a concern devoted to the manufacturing of Mogul die castings for automobile bearings, is so rushed with orders that the factory is forced to operate day and night.

The T H T Motor Car Company is one of the latest concerns to incorporate in Detroit. It has a capital of $100,000 and will devote its attention to the manufacture of automobiles and automobile parts, such as brass and aluminum castings.

Among the new automobile concerns established in Fairview, a suburb of Detroit, is the Hupp-Holloran Foundry. This is the first of a number of auto-parts companies to be established in that part of Detroit. This firm will employ 100 molders, making automobile castings in brass, aluminum and gray iron, specializing in castings for cylinders, crank cases and transmission cases. One part will be devoted to general jobbing. The officers of the company are R. C. Hupp, president; J. H. James, vice-president and general manager; L. G. Hupp, secretary and treasurer; John T. Holloran, superintendent. This firm reports a number of large contracts for many prominent Eastern users and for some of the largest automobile manufacturers in Detroit.

The boom in the manufacture of brass and aluminum continues as brisk as last month. The automobile manufacturers are straining every nerve to keep up with the orders that are flooding every plant in the city. The greatest difficulty now is to secure the necessary help. Skilled mechanics are at a premium. They are so much in demand that manufacturers in other lines are having difficulty keeping their men. Even the street car company feels the effect of the demand that is coming from the automobile and brass factories. Motormen and conductors are finding steady and remunerative work in the booming factories, and as a result the street car company is forced to import new men from the country districts.

Every brass factory in the city is working to its limit, many of them being forced to operate night shifts. Manufacturers see no let up for the future and expect present conditions to continue indefinitely.—F. J. H.

CINCINNATI, OHIO

It is estimated in dollars and cents that the output for the year 1910 will be worth $150,000,000 in the Cincinnati factory colony and manufacturing districts.

TRADE NEWS

TRADE NEWS OF INTEREST DESIRED FROM ALL OF OUR READERS. ADDRESS THE METAL INDUSTRY, 99 JOHN STREET, NEW YORK

Additional Trade News will be found under "Correspondence."

The Racine Aluminum and Brass Foundry, Racine, Wis., have moved into their new foundry.

A new foundry for making brass castings for pumps and fans will be built at Brazil, Ind., by the Cradford and McCrunnion Company.

It is reported that Shaeffer Company, Harrisburg, Pa., will build a brass foundry 100 by 120 feet for the production of brass specialties for the automobile trade.

A plant has been established at 285 South street, Boston, Mass., by the Machine Molded Brass Casting Company, for the manufacture of brass castings by a special process.

Indiana Brass and Iron Bed Company, Marion, Ind., have added to their foundry equipment two five-ton Newton cupolas, made by the Northern Engineering Works, Detroit, Mich.

Robert Kann, consulting chemist to the Raritan Copper Works, Perth Amboy, N. J., has opened at 24 Cliff street, New York, a commercial laboratory, making a specialty of metallurgical analyses and research.

The Mitchell and Van Meter Company, manufacturers of plumbers' brass goods, are contemplating the erection of a new plant which will include the installation of new plating and brass foundry departments.

The New Jersey Zinc Company, New York City, are going to put up several new buildings in the Lehigh Valley section of Pennsylvania and are in the market for structural materials. One of the new buildings will be used in the manufacture of zinc oxides.

Peerless Motor Car Company, Cleveland, Ohio, are building a foundry three stories high, 50 by 180 feet. The molding and casting of aluminum and brass castings will be done on the third floor. The second floor will be devoted to cores, while the first will be used for metal storage.

It is reported that the Baird Machine Company, manufacturers of tumbling barrels, wire stamping and cutting machines, Oakville, Conn., will build a new machine shop in Thomaston, Conn., in the near future. Rumor has it that the concern expects to erect a plant where about 150 people will be employed.

The New York branch of the Levett Manufacturing Company, 407 Canal street, is now under the management of C. T. Bowes, who has been connected with the company for some time in another capacity. Mr. Bowes announces that a full stock of polishers' and platers' supplies will be carried, and that immediate deliveries will be made to New York City customers from this stock. The Levett company's works are at Matawan, N. J.

L. G. Delamothe the plater, who is known throughout the United States as the developer of metallizing flowers, has moved to Santa Rosa, Cal., where he has put up a studio and will now metallize the Luther Burbank specialties. The Burbank specialties are, as is well known, a wonderful development of vegetable life particularly fruits and flowers. The metallizing of the Burbank products will put into lasting metallic form these wonderful species.

Leiman Brothers, 62 John street, New York, announce that they have recently installed a number of sand blasts for the purpose of cleaning the brass parts of electric light lamps in the following factories: The General Electric Company, Cleveland Electric Lamp Company, Rooney Electric Lamp Company, Harvey Hubbell, and others. The Breeze Carburetter Company and the Carter Carburetter Company, Newark, N. J., are also using Leiman's sand blast for the purpose of cleaning their brass goods and giving a good color to them. Several die-casting concerns are also using them for finishing castings. A large number of firms engaged in finishing metals are using Leiman's sand blast for cleaning purposes instead of the acid dip, as it does away with the unhealthful fumes that arise from the bath and cause frosted windows, etc. Among the companies that have adopted this method of cleaning are the Empire Art Metal Works, 610 Broadway; Union Gas & Electric Fixture Company, J. M. Ehrlich, president; The United Comb Company, 22 Bond street, all of New York City; The Seth Thomas Clock Company, and the New Haven Clock Company, New Haven, Conn.

PURCHASE OF COPPER MILL.

Messrs. C. C. Hussey & Co., proprietors of the Pittsburg Copper & Brass Roilling Mills of Pittsburg, have bought the copper business of the Crucible Steel Company of America. This business was established in 1859 by Messrs. Park, McCurdy & Co., afterwards the Park Steel Company, and later acquired by the Crucible Steel Company of America. The business is a large one, all sizes of sheets and brass being made. The sale includes all stocks held in about ten cities of the United States and Canada. Messrs. C. G. Hussey & Co. have been established in the copper business in Pittsburg in the manufacture of copper and brass since 1847. The product includes sheet copper, all sizes and finishes, copper conductor pipe, eaves trough, elbows and shoes in copper, copper ridge roll, copper and brass rivets, copper washers, corrugated copper gaskets for flange joints, soldering coppers and copper nails and tacks. The firm state that their stock in Pittsburg is the largest assortment in the United States, and shipments of stock sizes are made the day the order is received. The company also carries large stocks in New York, Chicago and St. Louis, from which shipments can be made to nearby points. They solicit correspondence for their stock sheet and catalogue.

REORGANIZATIONS

The name of the Tube Bending Machine Company has been changed to The Automatic Polishing Machine Company, which name more correctly describes the company's business. This firm is located at 148-150 Mulberry street, Newark, N. J. They manufacture the automatic polishing machine, which was described in THE METAL INDUSTRY in October, 1909, and which has been installed in a number of prominent factories, where it appears to be giving universal satisfaction.

James Savage, foreman of the brass and aluminum foundry of The Fiat Automobile Company, Poughkeepsie, N. Y., has resigned. Mr. Savage has formed a partnership under the name of Savage and Lee and started a foundry at 233 Java street, Brooklyn, N. Y. The new firm are prepared to execute orders for castings of aluminum, brass, copper and bronzes of every description and to furnish soft, black and brazing solder, brazing, babbitt, hydraulic and acid metals in ingot form.

The Risdon Tool Works has been succeeded by The Risdon Tool & Machine Company, of Waterbury, Conn. The new company has largely increased its facilities and has added other lines to its business. It will design and make dies, models, light machinery and tools, and is especially equipped for light manufacturing. It will also make a specialty of sub-press dies, the same as its predecessor. The officers and directors of the new concern are as follows:

Officers—W. L. Shepard, president; superintendent American

Mills Co., Waterbury, Conn. A. H. Dayton, vice-president; cashier Naugatuck National Bank, Naugatuck, Conn. George T. Wigmore, secretary and treasurer; assistant cashier Naugatuck National Bank, Naugatuck, Conn.

Directors—Matthew Adgate, superintendent Naugatuck Chemical Co., Naugatuck, Conn.; C. T. McCarthy, secretary Goodyear's I. R. Shoe Company, Naugatuck, Conn.; C. E. Beardsley, auditor Waterbury Brass Company, Waterbury, Conn.; C. W. Andrews, real estate, Naugatuck, Conn.; Wm. J. Neary, lawyer and real estate, Naugatuck, Conn.; W. L. Shepard, Geo. T. Wigmore.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Correspondence" columns.

G. W. Dyer Company, of Providence, R. I. Capital stock, $50,000. To manufacture jewelry. Incorporators: George W. Dyer, Nellie L. Dyer and Charles H. C. Carter.

Petow-Krieger Jewelry Company, of Providence, R. I. Capital stock, $50,000. To manufacture jewelry. Incorporators: Lazarus A. Petrow, Leon Krieger and Max Ross.

George E. Darling Cowpany, of Providence, R. I. Capital stock, $50,000. To manufacture jewelry. Incorporators: Margaret S. Darling, Byron A. Pierce and Ernest W. Pierce.

The Mastercraft Company, New York City, manufacturers and dealers in lead, zinc, copper etc. Capital, $10,000. Incorporators: Jas. A. Brodgon, John R. Snyder, Jas. C. Cleary, all of New York City.

The Seymour Metal Goods Company, Seymour, Conn., manufacturers and dealers in metal products of various kinds; capital, $100,000. Incorporators: G. H. Weaver, C. S. Boies and F. A. Rugg, all of Seymour.

BUSINESS TROUBLES

A trustee's sale of personal property will be held by C. F. Curtis, trustee of the estate of the Susquehanna Metal Mfg. Company, March 21, 1910, upon the premises formerly occupied by the bankrupt company in the Ash Building, Erie avenue, Borough of Susquehanna, Pa. A large quantity of machinery, shafting, dies, tools and factory fixtures, office supplies, a quantity of raw material, patents, and also a quantity of lumber, located on the Holdridge property, in the Borough of Oakland, Pa.

REMOVALS

Fitz, Dana & Brown, metal dealers, have moved their offices to the corner of Pearl and William streets, New York City.

Albert Furniss, die sinker, modeler and mould maker, formerly of 145 Grove street, Bridgeport, Conn., has moved to Stratford, Conn.

Henry Hollender, a manufacturer of wire and metal goods, formerly located at 77 White street, New York, has moved to 1185 State street, Bridgeport, Conn.

The American Sanitary Manufacturing Company, manufacturers of sanitary brass goods, formerly located at Detroit, Mich., have moved to Abingdon, Ill.

The Northern Ohio Manufacturing and Refining Works, gold, silver and bronze platers and repairers of all kinds of metal goods, will move their factory March 31 to 2069 East Fourth street, Cleveland, O., which is just opposite their present location.

The Vernon Metal Company, Hudson Terminal, 30 Church street, New York, dealers in aluminum, copper, tin, lead, spelter and antimony, will shortly move their office to larger quarters on the sixth floor of the same building in which they are now located.

Wm. H. Nicholls, Cortlandt Building, Hudson Terminal, 30 Church street, New York, who represents a number of prominent manufacturers of foundry equipment and supplies, has taken larger offices in the same building, where he will be pleased to receive his customers and friends.

The Hanson & Van Winkle Company of Newark, N. J., report that they expect to move into their new quarters at 269-271 Oliver street, about April 1, but are not positive that they will do so, as they may find it advantageous to remain in their present office for a few weeks longer. A description of their new building was published in The Metal Industry for November, 1909.

The Elmira Machine Works, manufacturers of brass and bronze castings, etc., formerly of Grover, Pa., have moved to their new plant at Union Broome County, N. Y., where, because of better manufacturing and shipping facilities, better help supply and larger capital, they are in a better position than ever to take care of all orders.

FIRES

The three-story brick building of the Springfield Facing Company, Springfield, Mass., was practically destroyed by fire on the night of March 1. The mill, which was devoted to the production of facings and other foundry supplies, had been rebuilt in 1906, and was valued, with its machinery, at about $50,000. The loss is fully covered by insurance.

The office of A. Klipstein & Co., manufacturers and importers of caustic potash, sal ammoniac, zinc dust and other chemicals for electro-platers, galvanizers and metal manufacturers, at 122 Pearl street, New York City, were seriously damaged by fire on Feb. 28. On account of the fire some confusion resulted, but within a few days the firm had settled in large, new offices in the Beaver building, 129 Pearl street, and had arranged to take care of all orders. This firm does a business in chemicals of about one and one-half million dollars per month.

PRINTED MATTER

Reducing Agents. R. F. Lang, 31-33 Broadway, New York City, has issued some new pamphlets relating to Royal phosphor copper, phosphor tin, manganese copper and silicon copper, which are of special interest to the foundry trade and will be sent free on application.

A Modern Electrotype Foundry is described in a pamphlet issued by the Geo. W. Saam Company, New York City. The plant occupies very handsome quarters and every department is equipped in an up-to-date manner for carrying on the business of making electrotypes.

Homogen.—The brass flux and iron neutralizer manufactured by the Allyne Brass Foundry Company, Cleveland, Ohio, is the subject of a poster folder just issued by their company. This card contains information regarding the efficiency of "Homogen," and a special offer for a trial order.

Die Sinking, Designing and Engraving.—The Superior Seal & Stamp Company, 241 Jefferson avenue, Detroit, Mich., announce that they have a department for making steel stamps, letters and figures, embossing dies, seal presses, brass stencils, box dies, etc., and any work of that class.

Celluloid Enamels. The Celluloid Zapon Company, New York City, are sending out attractive and interesting pamphlets showing the many colors in which their celluloid enamels are furnished. These colors include various shades of yellow, brown, green, blue, black and red, as well as white.

ANNEALING, HARDENING AND TEMPERING FURNACES. The Rockwell Furnace Company, 26 Cortlandt street, New York, have just issued their new catalogue, giving full data and information regarding their under and over fired furnaces suitable for all operations relating to hardening, tempering and annealing.

BRISTOL'S RECORDING INSTRUMENTS AND PATENT STEEL BELT LACING, manufactured by the Bristol Company of Waterbury, Conn., are fully described in recent bulletins 108, 112, 113 and 115. These bulletins are all of a sectional character and are designed to be put in a loose leaf holder to make an up-to-date and comprehensive catalogue.

SARCO PYROMETERS.—A pamphlet descriptive of these recording and indicating pyrometers has been issued by the Sarco Fuel Saving & Engineering Company, 90 West street, New York. These instruments are manufactured for the Sarco Company under the personal direction of C. B. Thwing, Ph. D., under the various Thwing patents on pyrometers.

SANGAMO AMPERE-HOUR METERS.—Bulletin No. 17, relating to the various types of ampere-hour meters for direct current circuits, as manufactured by the Sangamo Electrc Company, Springfield, Ill., has been issued under date of Feb., 1910, and supersedes Bulletins 14 and 15. A complete price list of the ampere-hour meters is contained in the back of the bulletin.

HARDWARE SPECIALTIES. A 130-page catalogue issued by the Cassady-Fairbank Manufacturing Company, Chicago, Ill., gives a complete description of the line of hardware specialties manufactured by them. The list includes kitchen utensils, bathroom fittings, hat and coat racks, nut crackers and nut pick sets, and also steel stamping and automatic machine work.

FERROOL HOCKSIT is the name of a hard solder for cast iron that is described in a 12-page booklet issued by R. F. Lang, 31 Broadway, New York. This material is a paste, ready for immediate use, which, together with a small quantity of brass solder, borax and a charcoal fire, will restore any broken or fractured cast iron machine part to its original state.

MAGNETIC SEPARATORS.—Bulletin No. 21 has been issued by the Dings Electro Magnetic Separator Company, Milwaukee, Wis. In this bulletin the company describes and illustrates their various styles of "Magnetic Separators," which are used in all parts of the world for separating and cleaning non-magnetic and magnetic materials. These separators find a general application in almost every industry that uses metals in any shape or form.

GAS ENGINE BEARINGS.—The Empire Metal Company, Syracuse, N. Y., tell about various kinds of bearings manufactured by them, in a small 12-page booklet, recently issued. The Empire Metal Company manufacture bearings of all grades and for all purposes, from the very softest of babbitt up to the hardest type of manganese or phosphor bronze, and will be pleased to send the booklet upon request and answer any questions relating to bearing metal and its applications.

GRINDING AND POLISHING MACHINERY, catalogue (D.), consisting of 216 pages, has just been issued by the Diamond Machinery Company, of Providence, R. I. This publication covers their complete line of grinding and polishing machinery and shows for the first time their heavy face grinders, lathe grinding attachment and center grinders, diamond disc and emery ring grinders. Many of these machines are described in special circulars, which they would be glad to send on request.

ALUMALOYD SHEETS.—A special analysis metal sheet coated with aluminum-alloyed metal is described in a book issued by the Stark Rolling Mill Company, of Canton, Ohio. This metal is designed especially for automobile bodies, fenders, hoods and in fact for every part requiring sheet metal. It can be drawn, stamped, pressed, double seamed and soldered and is strong, durable, scaleless and rustless. Prices and samples, together with all information, may be obtained by corresponding with the company.

DIE CASTING.—The Doehler Die Casting Company, Brooklyn, N. Y., have issued a 16-page brochure giving a full description, together with the photographs, of many kinds of die-cast articles produced by them. These die castings are made in steel dies by a patented process and consist of automobile accessories, roller bearing and ball bearing cages, gears of all descriptions, especially internal, spiral, bevel and intermediate, and also contains parts for electric, gas and water meters, piano players, organs, valves, etc., produced in non-corrosive, high-class tin alloys.

THE YALE DOUBLE-ACTING DOOR CHECK.—The Yale & Towne Manufacturing Company, 9 Murray street, New York City, have issued a 10-page booklet in the interest of the "Yale Double-Acting Door Check" for double doors. This door check is shown in the booklet by means of half-tone illustrations in various positions, both on and off the door. Anyone interested in this class of doors should correspond with the company for this booklet, and also for information regarding display cards, street car cards, newspaper advertisements, etc., relating to the products of the Yale & Towne Company.

ACHESON-GRAPHITE PRODUCTS, is the subject of a folder issued by the International Acheson Graphite Company, Niagara Falls, N. Y. The folder describes the Acheson graphite as the purest graphite in the world and claims that each grade is of uniform quality. The Acheson graphite greases are exceptionally adapted for gear, cups and ball bearing lubricants. The same company also manufactures the Acheson graphite electrodes, for which are claimed long life, high conductivity (four times that of other electrodes), low porosity and great economy, as compared with amorphous carbon electrodes.

CLEANING BY ELECTRICITY, ZINC AND NICKEL PLATING. The American Electro Chemical Company, 863 North Franklin street, Chicago, Ill., have issued a booklet treating on cleaning by electricity, zinc plating and nickel plating on zinc. This booklet gives valuable information to those who desire to do rust-proof nickeling, also for those seeking greater economy or perfection in their plating department. The pamphlet is free for the asking. The company state that they are in a position to quote the lowest prices on all chemicals required for the formulas that are enumerated in the book.

GAS FURNACES.—The 1910 catalogue of the Westmacott Gas Furnace Company, Providence, R. I., has just been issued. This catalogue consists of 50 pages and gives full descriptions of the various furnaces manufactured by this company. These furnaces include hardening and annealing furnaces of the oven type for hardening high carbon tool steel and for annealing all metals, cylindrcal or crucible furnaces for high speed steel and also for melting copper, brass and bronze; soft metal melting furnaces for making all varieties of soft metals, such as lead and babbitt; smelting furnaces for reducing sweepings, filings, etc., together with blow pipes and blowers.

METAL STATISTICS FOR 1910 has been issued by the American Metal Market Company, Inc., 91 Fulton street, New York City. This is a compilation of reliable statistics dealing with the production, consumption and price movements of iron, steel, copper, tin, spelter, lead, antimony and other metals, and is probably one of the most useful and convenient references which has ever been issued. The iron and steel statistics cover 50 pages and give a wide range of useful information concerning iron ore, pig iron and also the various finished steel products. Owing to the special interest that has been taken in the copper market during the past year, the section devoted to the copper statistics has been considerably enlarged, and all the more important facts relating to this metal have been presented. The tables are so arranged that comparisons can be made over a period of 25 years.

AD NEWS

Leiman Brothers, 62 John street, New York, feature their pressure blowers and sand blasts. A request to Department "J" will bring full particulars.

The Automatic Polishing Machine Company, Newark, N. J.,

illustrate their tube polishing machine and invite those interested to send for their new booklet PM.

The Buckeye Products Company, Cincinnati, O., are again advertising their foundry specialties, including parting and core compounds, fluxes, core oil, molasses and aluminum solder.

The Maxwell Metal Reduction Company, School and Borden avenues, Long Island City, N. Y., announce that their facilities for making all kinds of ingot metals are unexcelled. They are also buyers of all kinds of foundry residues.

COPPER PRODUCTION

(Issued by the Copper Producers' Association.)

	March 10, 1910. Pounds.
Stock of marketable copper of all kinds on hand at all points in the United States February 1, 1910..	98,463,339
Production of marketable copper in the United States from all domestic and foreign sources during February, 1910	112,712,493
	211,175,832
Deliveries:	
For domestic consumption	66,618,322
For export	37,369,518
	103,987,840
Stock of marketable copper of all kinds on hand at all points in the United States March 1, 1910....	107,187,992
Stocks increased during the month of February....	8,624,653

METAL MARKET REVIEW.

NEW YORK, March 10, 1910.

COPPER.—Standard copper in London shows a further decline during the month of February of £2 per ton, making a net decline of about £4 per ton since the beginning of the year. This decline in London is quite interesting, in view of the heavy reductions in the stocks of copper in America, as published by the Copper Producers' Association on the 10th of February. It is evident that these figures were not taken seriously, and we refer to them again later on. According to the foreign statistics, the stocks abroad on Feb. 15 were 114,100 long tons, an increase of 5,100 tons in the visible supply since Jan. 1, 1910.

The domestic copper market during the month under review was dull and quiet, and prices of electrolytic sagged off from ⅛ to ¼ cent per pound. The leading interest reduced the price down to 13½c., 30 days, delivered, for electrolytic, and 13⅜c. for export, while dealers were taking orders at a shade under this figure. Towards the end of the month there was a better demand from consumers and for export, and prices were advanced for export from 13⅜c. to 13⅝c, and for consumers from 13½c. to 13¾c. at the close.

The exports for the month, as compiled by the secretary of the New York Metal Exchange, from Customs House returns each day, are 24,794 tons against 13,886 tons same month last year, so far this year we have exported 51,493 tons, against 33,076 tons for the same period in 1909.

According to the figures published by the Copper Producers' Association Feb. 10, the exports of copper were 10,000 tons, or over 22,000,000 pounds more than the exports as compiled by the secretary of the New York Metal Exchange from the records of the custom house each day. This excess of exports will have to be accounted for sooner or later, as the figures stand at present. the exports of the Copper Producers' Association are over 22,000,000 pounds more than the custom house returns show. The explanation given by the association is that as soon as the copper is delivered to the cars for export, it is classed as exports; while it may not actually get to the ship and on the custom house records until the month following, so all the time there is likely to be more or less of a discrepancy.

The European statistics of copper show a slight decrease in the total visible supply since the middle of the month. The stocks at the end of February was 113,460 tons, against 52,290 tons in February, 1909.

The prices today are: Lake, 13¾ c. to 13⅞c.; electrolytic, 13½c. to 13⅝c.; casting, 13⅜c. to 13½c.

SHEET METALS.—The price of sheet copper has been advanced to 19 cents; this price is only likely to hold if copper keeps firm.

TIN.—The London tin market has shown the usual erratic fluctuations. Opening at £148 5s., prices advanced to £152 5s., the highest, touched £146 15s. at the lowest, and closed at £149.

The statistics for the month appear favorable for the "bulls." Total visible supply decreased about 2,000 tons, but the point of most interest was the heavy deliveries into consumption, amounting to 3,600 tons, showing an increase of 1,200 tons for the two months of 1910, as compared to the same period in 1909. Price today is around 32.85c. for 5-ton lots spot, and a shade lower for futures.

LEAD.—The foreign lead market holds at around £13 2s. 6d.

The New York market has sagged off about 10 points during the month, closing at from 4.70c. to 4.65c, New York, carload lots, and at 4.45c. to 4.50c., East St. Louis delivery.

SPELTER.—The foreign market holds steady at close to £23.

Prices of spelter in the New York market gradually declined all the month, while spot spelter in New York was scarce, and prices held fairly steady, the future market in St. Louis was weak, and with continually lower offerings, the market broke from 6.15 on the first of the month to 5.65 at the close. Prices today, carload lots, New York, 5.80 to 5.85, and in East St. Louis, 5.60 to 5.65.

ANTIMONY.—Prices in London unchanged. £30 10s. for Hallett's and £29 10s. for ordinary.

In New York the market has been without feature. Cookson's at 8½, Hallett's 8¾, with Hungarian grade at around 7¼ to 7⅜.

ALUMINUM.—This market has ruled quite firm, and prices show a further advance of about ½ cent per pound. The domestic price is nominally 24 cents for 1-ton lots, while imported aluminum can be laid down at from 23 to 23¼ cents, according to quality.

SILVER.—The London silver market shows a slight decline for the month, from 23¾d. at the opening to 23 5-16d. at the close.

In New York prices are about 1 cent per ounce lower than a month ago, closing at 50½ cents, against 51½ cents at the opening.

QUICKSILVER.—Prices are $1 per flask lower today, at $50 for wholesale lots, with jobbing lots at $51.50 to $52. Rothschild's price is £9 5s.

PLATINUM.—The market is inclined to be easier again, $29 for ordinary to $34.50 for hard. Scrap is worth about $20 to $22 per ounce.

OLD METALS.—There is very little change to report in the old metal market. Prices were a shade easier all around all the month, but with a firmer copper market we may see an improvement in demand.

THE FEBRUARY MOVEMENTS IN METALS

COPPER.	Highest.	Lowest.	Average.
Lake	13.85	13.65	13.75
Electrolytic	13.75	13.45	13.55
Casting	13.60	13.25	13.45
TIN	33.45	32.45	32.95
LEAD	4.60	4.40	4.55
SPELTER	6.25	5.65	5.90
ANTIMONY (Hallett's)	8.40	8.25	8.30
SILVER	.52¼	.50½	51.53

WATERBURY AVERAGE

The average price of lake copper per pound as determined monthly at Waterbury, Conn.

1909.—Average for year, 13.416. 1910.—Jan. 13⅞. Feb. 13⅞.

DAILY METAL PRICES

We have made arrangements with the New York Metal Exchange by which we can furnish our readers with the Official Daily Metal Market Report of the Exchange and a year's subscription to THE METAL INDUSTRY for the sum of $10. The price of the report alone is $10. Sample copies furnished for the asking. We can furnish daily telegraphic reports of metal prices. Address THE METAL INDUSTRY, 99 John street, New York.

Metal Prices, March 11, 1910

NEW METALS.

	Price per lb. Cents.
COPPER—PIG, BAR AND INGOT AND OLD COPPER. Duty Free, Manufactured 2½c. per lb.	
Lake, carload lots	13.85
Electrolytic, carload lots	13.62½
Casting, carload lots	13.50
TIN—Duty Free.	
Straits of Malacca, carload lots	32.85
LEAD—Duty Pigs, Bars and Old, 2½c. per lb.; pipe and sheets, 2¾c. per lb.	
Pig lead, carload lots	4.70
SPELTER—Duty 1⅜c. per lb. Sheets, 1⅝c. per lb.	
Western carload lots	5.65
ALUMINUM—Duty Crude, 7c. per lb. Plates, sheets, bars and rods, 11c. per lb.	
Small lots	28.00
100 lb. lots	25.00
Ton lots	23.00
ANTIMONY—Duty 1½c. per lb.	
Cookson's, cask lots, nominal	8.50
Hallett's, cask lots	8.25
Other cask lots	7.50
NICKEL—Duty Ingot, 6c. per lb. Sheet, strips and wire 35% ad valorem.	
Shot, Plaquettes, Ingots, Blocks, according to quantity	.45 to .60
MANGANESE METAL—Duty 20%	.80
MAGNESIUM METAL—Duty 3 cents per pound and 25% ad valorem	$2.00
BISMUTH—Duty free	1.80
CADMIUM—Duty free	.75
	Price per oz.
GOLD—Duty free	$20.67
SILVER—Duty free	.50½
PLATINUM—Duty free	28.80
QUICKSILVER—Duty 7c. per lb. Price per pound	69c. to 73c.

OLD METALS.

Dealers' Buying prices. Cents per lb.		Dealers' Selling prices. Cents per lb.
12.00 to 12.25	Heavy Cut Copper	13.00 to 13.50
11.50 to 12.00	Copper Wire	12.75 to 13.00
10.75 to 11.00	Light Copper	11.50 to 11.75
11.00 to 11.25	Heavy Mach. Comp	12.00 to 12.50
8.50 to 8.75	Heavy Brass	9.50 to 9.75
6.50 to 7.00	Light Brass	7.50 to 7.75
7.50 to 7.75	No. 1 Yellow Brass Turnings	8.50 to 8.75
9.00 to 9.50	No. 1 Comp. Turnings	10.00 to 10.50
4.25 to 4.30	Heavy Lead	4.40 to 4.50
4.00 to 4.50	Zinc Scrap	—— to 4.75
5.00 to 5.50	Scrap Aluminum, turnings	5.00 to 5.50
10.00 to 12.00	Scrap Aluminum, cast, alloyed	11.00 to 13.00
14.00 to 15.00	Scrap Aluminum, sheet (new)	16.00 to 18.00
19.50 to 20.00	No. 1 Pewter	23.00 to 24.00
20.00 to 25.00	Old Nickel	22.00 to 27.00

INGOT METALS.

	Price per lb. Cents.
Silicon Copper, 10% to 20%....according to quantity	28 to 35
Silicon Copper, 30% guaranteed. " "	38
Phosphor Copper, 5% " "	19 to 21
Phosphor Copper 10% to 15%, guaranteed " "	28 to 30
Manganese Copper, 30% " "	30 to 35
Phosphor Tin " "	34 to 36
Brass Ingot, Yellow " "	9 to 10
Brass Ingot, Red " "	12 to 13
Bronze Ingot " "	11 to 12
Manganese Bronze " "	17 to 19
Phosphor Bronze " "	13 to 16
Casting Aluminum Alloys " "	29 to 35

PHOSPHORUS—Duty 18c. per lb.
According to quantity ..... 30 to 35

PRICES OF SHEET COPPER.

BASE PRICE, 19 Cents per Lb. Net.

PRICES MENTIONED BELOW ARE FOR QUANTITIES OF 100 LBS. AND OVER.

SIZE OF SHEETS.		64 oz. and over 50 lb. sheet 30 x 60 and heavier.	32 oz. to 64 oz. 25 to 50 lbs. sheet 30 x 60.	24 oz. to 32 oz. 18¾ to 25 lb. sheet 30 x 60.	16 oz. to 24 oz. 12½ to 18¾ lb. sheet 30 x 60.	14 oz. and 15 oz. 11 to 12½ lb. sheet 30 x 60.	12 oz. and 13 oz. 9½ to 11 lb. sheet 30 x 60.	10 oz. and 11 oz. 7⅞ to 9½ lb. sheet 30 x 60.	8 oz. and 9 oz. 6¼ to 7⅞ lb. sheet 30 x 60.	Lighter than 8 oz.
		Cents Per Pound Over Base Price for Soft Coppers								
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	1	2	3	6	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	3	6	9	
	Longer than 96 inches.	"	"	"	"	2	6			
Wider than 30 ins. but not wider than 36 inches.	Not longer than 72 inches.	"	"	"	"	2	4	7	10	
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	2	6	9		
	Longer than 96 inches. Not longer than 120 inches.	"	"	"	1	3				
	Longer than 120 inches.	"	"	1	2					
Wider than 36 ins. but not wider than 48 inches.	Not longer than 72 inches.	"	"	1	2	4	7	10		
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	5	8			
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	8				
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins. but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	6	11			
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	9				
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches.	2	4	7						
	Longer than 120 inches.	3	5	9						
Wider than 108 ins.	Not longer than 132 inches.	4	6							
	Longer than 132 inches.	5	8							

The longest dimension in any sheet shall be considered as its length.

CIRCLES, SEGMENTS AND PATTERN SHEETS, advance over prices of Sheet Copper required to cut them from. 3 cents per pound.

COLD OR HARD ROLLED COPPER, 14 oz. per square foot, and heavier, add ..... 1 " " "

COLD OR HARD ROLLED COPPER, lighter than 14 oz., per square foot, add ..... 2 " " "

POLISHED COPPER, 20 INCHES WIDE and under, advance over price for Cold Rolled Copper of corresponding dimensions and thickness ..... 1 " " sq. ft.

POLISHED COPPER, WIDER THAN 20 INCHES, advance over price for Cold Rolled Copper of corresponding dimensions and thickness ..... 2 " " " "

COLD ROLLED COPPER, PREPARED SUITABLE FOR POLISHING, same as Polished Copper of corresponding dimensions and thickness.

COLD ROLLED AND ANNEALED COPPER SHEETS OR CIRCLES, same price as Cold or Hard Rolled Copper of corresponding dimensions and thickness.

ROUND COPPER ROD, ⅜ inch diameter or over ..... **Base Price.**
(Rectangular, Square and Irregular Shapes, Copper Rod, Special Prices.)

ZINC—Duty, sheet, 1⅜c. per lb. Cents per lb.
Carload lots, standard sizes and gauges, at mill ..... 7.75 less 8%
Casks 8.25
Open casks 8.75

Metal Prices, March 11, 1910

PRICES ON BRASS MATERIAL—MILL SHIPMENTS.

In effect November 22, 1909, and until further notice.

To customers who purchase less than 40,000 lbs. per year and over 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.14¼	$0.15⅝	$0.17⅝
Wire	.14¼	.16½	.18
Rod	.14¼	.16½	.19
Brazed tubing	.19⅜	—	.21½
Open seam tubing	.17⅝	—	.19½
Angles and channels, plain	.17⅝	—	.19½

50% discount from all extras as shown in American Brass Manufacturers' Price List No. 7.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring, drawing and spinning brass...	½c.	per lb. net advance
" —Best spring, drawing and spinning brass....	1½c.	" " " "
Wire —Extra spring and brazing wire	½c.	" " " "
" —Best spring and brazing wire	1c.	" " " "

To customers who purchase less than 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.15½	$0.16⅝	$0.18⅝
Wire	.15½	.17½	.19
Rod	.15¼	.17½	.20
Brazed tubing	.20⅜	—	.22½
Open seam tubing	.18⅝	—	.20½
Angles and channels, plain	.18⅝	—	.20½

5% discount from all extras as shown in American Brass Manufacturers' Price List No. 7.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring, drawing and spinning brass...	½c.	per lb. net advance
" —Best spring, drawing and spinning brass....	1½c.	" " " "
Wire —Extra spring and brazing wire	½c.	" " " "
" —Best spring and brazing wire	1c.	" " " "

BARE COPPER WIRE—CARLOAD LOTS.

15.25 per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order	18½c.	per lb. base.
100 lbs. to 300 lbs. in one order	19c.	" " "
Less than 100 lbs. in one order	20½c.	" " "

PRICES FOR SEAMLESS BRASS TUBING.

From 1¼ to 3½ in O. D. Nos. 4 to 13 Stubs' Gauge, 18c. per lb.
Seamless Copper Tubing, 22c. per lb.

For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron Pipe Size	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb.	26	25	20	19	18	18	18	18	18	18	18	19	20	22	24	25

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

	Per 100 feet Brass.	Bronze.
⅜ inch	$8	$9
½ inch	8	9
⅝ inch	10	11
¾ inch	12	13
⅞ inch	14	15
1 inch	18	20
1¼ inch	22	24
1¼ inch	25	27
1½ inch	32	35
1¾ inch	45	48
2 inch	56	60

Discount 45 and 5%.

PRICES FOR MUNTZ METAL AND TOBIN BRONZE.

Muntz or Yellow Metal Sheathing (14" x 48")	15c.	lb. net base
" " " Rectangular sheets other than Sheathing	17c.	" " "
" " " Rod	15c.	" " "
Tobin Bronze Rod	16c.	" " "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bars in the rough 23¼c. net.

German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturers.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Not over 18 in. in width, not thinner than 23 B. S. Gauge, 2c. above price of pig tin in same quantity.

Not over 35 in. in width, not thinner than 22 B. S. Gauge, 3c. above price of pig tin.

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

	Wider than ..... 31in.	6in.	14in.	16in.	18in.	20in.	24in.	30in.	36in.
	and including.... 12in.	14in.	16in.	18in.	20in.	24in.	30in.	36in.	40in.
	in coils.								
No. 13 and heavier	34	34	36	36	36	36	39	39	39
" 14	34	34	36	36	36	36	39	39	39
" 15	34	34	36	36	36	36	39	39	39
" 16	34	34	36	36	36	36	39	39	39
" 17	34	34	36	36	36	36	39	39	39
" 18	34	34	36	36	36	36	39	39	42
" 19	34	34	36	36	36	36	39	40	43
" 20	34	36	36	36	36	38	41	42	44
" 21	34	38	38	38	38	40	43	44	50
" 22	34	38	38	38	40	40	43	47	51
" 23	34	38	38	38	40	40	43	49	52
" 24	34	38	40	42	42	42	45	51	54
" 25	36	39	41	43	43	43	46	53	57
" 26	36	39	42	46	46	46	51	55	61
" 27	36	40	44	48	48	49	54	58	64
" 28	36	40	46	48	49	49	56	62	67
" 29	38	41	48	50	52	52	61	67	72
" 30	38	42	50	52	56	62	69	72	77
" 31	43	47	55	58	63	71	74	77	83
" 32	45	49	57	61	69	77	91	90	95
" 33	47	51	60	65	73	84	91	100	110
" 34	50	55	62	70	78	91	103	110	120
" 35	..	65	70	80	90	100	115	125	..
" 36	..	80	90	100	115	120	135	..	..
" 37	..	104	114	129	144	159	174	..	..
" 38	..	124	139	154	169	184	204	..	..
" 39	..	144	164	184	204	224	..	..	..
" 40	..	174	204	224	244	..	..	..	..

In flat rolled sheets the above prices refer to lengths between 2 and 3 feet. Prices furnished by the manufacturers for wider and narrower sheet. All columns except the first refer to flat rolled sheet. Prices are 100 lbs. or more at one time. Less quantities 3c. lb. extra. Charges made for boxing.

PRICE LIST SEAMLESS ALUMINUM TUBING.

STUBS' GAUGE THE STANDARD. SIZES CARRIED IN STOCK.
Outside Diameters. BASE PRICE, 25 Cents per Pound.

Stubs' Gauge.	Inches.	⅛ in.	5-16 in.	⅜ in.	½ in.	⅝ in.	¾ in.	⅞ in.	1 in.	1¼ in.	1½ in.	1¾ in.	2 ins.	2½ ins.	3 ins.	3½ ins.	4 ins.	4½ ins.
11.	.120.	..	..	..	..	..	..	..	27	24	..	..	14	12	10	9	16	28
12.	.109.	..	..	..	..	..	..	..	26	..	..	..	15	..	..	..	..	..
14.	.083.	..	..	..	..	..	..	..	..	..	..	..	17	..	..	..	..	..
16.	.065.	..	..	..	..	..	28	27	27	24	23	21	21	21	21	27	31	37
18.	.049.	..	..	..	..	33	30	29	28	25	26	26	26	..	..	..	..	..
20.	.035.	117	..	46	39	34	33	32	30	29	30	30	30	31	38	49	58	81
21.	.032.	..	..	..	40	..	..	..	..	..	..	..	..	..	..	..	..	..
22.	.028.	138	98	48	42	38	37	35	34	..	..	45	..	..	..	..	..	..
24.	.022.	188	133	108	88	79	73	62	60	66	..	..	..	..	..	..	..	..

Prices are for ten or more pounds at one time. For prices on sizes not carried in stock send for Manufacturers' List.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

Diameter. B. & S. G'ge.	000 to No. 10.	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price, per lb....	32	32½	32½	33	33½	34	34½	35	36	37	38	43	46

200 lbs. to 30,000 lbs., 3 cents off list; 30,000 lbs. and over, 4 cents off list.

PRICE LIST FOR GERMAN SILVER IN SHEETS AND ROLLS.

Per cent.	Price per lb.	Per cent.	Price per lb.
12	$0.52	16	$0.58
13	.53	17	.59
14	.54	18	.60
15	.55		

These prices are for sheets and rolls over 2 inches in width, to and including 8 inches in width and to No. 20, inclusive, American or Brown & Sharpe's Gauge. Prices are for 100 lbs. or more of one size and gauge in one order. Discount 50%.

GERMAN SILVER TUBING.

4 per cent.	to No.	19,	B. & S.	Gauge, inclusive	$0.60
6 "	"	19,	"	" "	.70
9 "	"	19,	"	" "	.85
12 "	"	19,	"	" "	1.00
15 "	"	19,	"	" "	1.15
16 "	"	19,	"	" "	1.20
18 "	"	19,	"	" "	1.30

German Silver Tubing thinner than No. 19 B. & S. Gauge add same advances as for Brazed Brass Tube.

For cutting to special lengths add same advances as for Brazed Brass Tube. Discount 40%.

PRICE OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quality and market conditions. No fixed quotations can be given as prices range from 2c. below to 6c. above the price of bullion.

Rolled silver anodes .999 fine are quoted at 2c. to 3c. above the price of bullion.

THE UNITED STATES ALUMINUM COMPANY

PITTSBURGH, PA.

ALUMINUM

SHEET TUBING
EXTRUDED SHAPES
ROD RIVETS WIRE
ELECTRICAL CONDUCTORS

Branch Offices

NEW YORK—99 John St.
BOSTON—131 State St.
CHICAGO—Old Colony Bldg.
PITTSBURGH—1504 Park Bldg.
PHILADELPHIA—320 Witherspoon Bldg.
ROCHESTER—406 Powers Block
CLEVELAND—719 Garfield Bldg.
WASHINGTON—514 Nat. Met. Bk. Bldg.
DETROIT—1515 Ford Bldg.

DIRECTORY

METAL ROLLING MILLS.

INGOT, PLATE, SHEET, ROD, WIRE, TUBE, METAL GOODS.

HENDRICKS BROTHERS
Manufacturers of
Sheet and Bar Copper
COPPER FIREBOX PLATES
and STAYBOLTS
WIRE and BRAZIER'S RIVETS
IMPORTERS AND DEALERS IN
INGOT COPPER, BLOCK TIN,
SPELTER, LEAD, ANTIMONY
BISMUTH, NICKEL, Etc.
49 Cliff Street, NEW YORK

Established 1802 Cable Address: "Scovill"
SCOVILL MFG. CO.
WATERBURY, CONN.
THE LARGEST AND MOST FULLY EQUIPPED BRASS ROLLING MILLS AND METAL GOODS MANUFACTURING ESTABLISHMENT IN THE WORLD
Estimates for Specialties in Brass, German Silver and Aluminum furnished on application. DEPOTS:
NEW YORK: 75 Spring St. BOSTON: 170 Summer St. CHICAGO: 210 Lake St.

WATERBURY BRASS CO.
General Offices, Mills and Factories.
Waterbury, Conn.
NEW YORK OFFICE, 99 JOHN STREET.
Providence (R. I.) Store, 131 Dorrance St.
Shipments Upon Receipt of Order From Large Stock of
SEAMLESS DRAWN BRASS AND COPPER TUBING
BRASS { SHEET ROD WIRE COPPER { SHEET ROD WIRE
AT WATERBURY GERMAN SILVER { SHEET ROD WIRE

Non-Corrosive Finest Quality
COPPER AND YELLOW
(Muntz) Metal
Naval Brass
Naval Bronze
Manganese Bronze
Plates, Sheets, Bolts, Bars, Rods, Nails, Tacks, &c.
Taunton-New Bedford Copper Co.
NEW BEDFORD, MASS.
71 Water St., New York 61 Batterymarch St., Boston

C. G. HUSSEY & CO.
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Sheets, Rods, Wire, Ingots, Castings, Jewelers' Bars and Alloys
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TUBING FOR ELECTRICAL PURPOSES
Odd and Special Shapes, and Small Tubing, a Specialty
—ALSO THE—
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All sizes from 8 to 36, B. & S. Gauge.

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255 RANO STREET
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SMALL SIZES
Seamless Brass and Copper Tubing
PROMPT DELIVERY

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6 in. and narrower
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Horsehead Spelter

The Original Brand of Pure Spelter

Indispensable in the manufacture of

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SUITABLE FOR ALL PURPOSES

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Offer for Sale:

HEAVY COPPER AND WIRE
Ready for the Crucible

COMPOSITION
Carefully Selected

HEAVY YELLOW BRASS
Free from Iron

OLD METALS GENERALLY

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Heavy Copper and Copper Wire Cut in Crucible Shape.

Number One Red Brass Scrap.

Heavy Yellow Brass Scrap.

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Improves the Strength of

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For Advertisement of
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See Page 53

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THE LARGEST EXCLUSIVELY ALUMINUM FOUNDRY IN THE UNITED STATES.

The Fairfield Aluminum Foundry Corp.

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Large castings a specialty, 1000 to 3000 lbs. and up

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ALUMINUM CASTINGS

Our Aluminum Castings are especially adapted to Automobile, Auto Boat and Aerial Construction.

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SPECIAL GOODS made to order.
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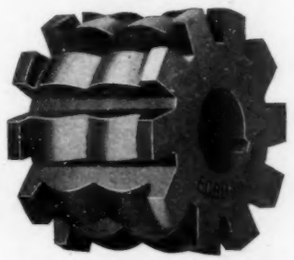

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is a necessity in any factory on account of the higher speed at which it can be run and the manner in which it holds its cutting edge sharp, seldom requiring any grinding; therefore more cutter and machine hours.

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OTTO GAS AND GASOLINE ENGINES

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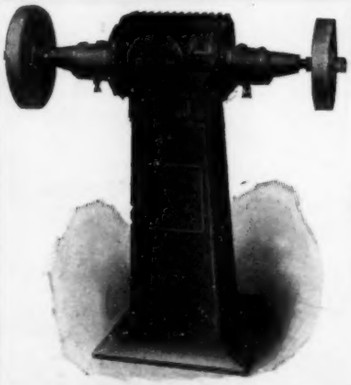

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Peerless Polishing Wheel

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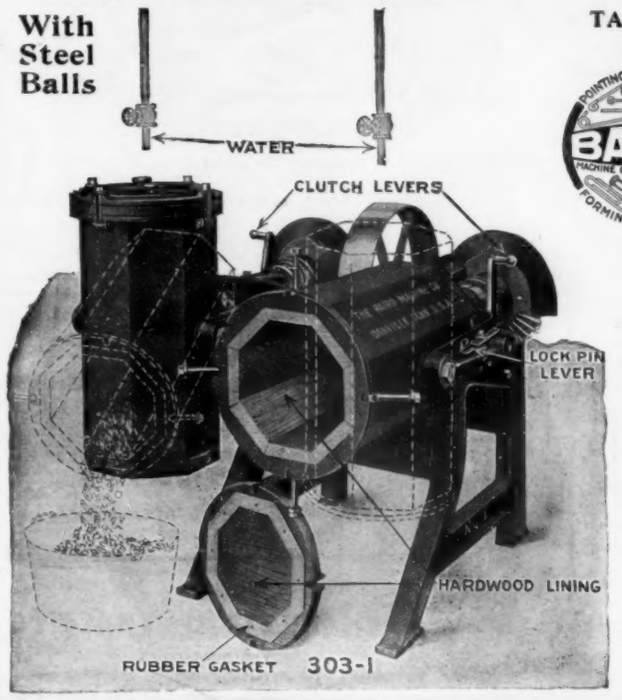
With Steel Balls



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Impart a good, highly polished surface to such articles as electrical goods, buckles, hose supporter and suspender trimmings, bag and purse ornaments, collar buttons, rings, pins, chains, flat metal articles, small castings, etc., etc.

EXCEEDINGLY SIMPLE TO OPERATE

Barrels can be tilted, made watertight, and are independently driven, so that one can be emptied and refilled while the other is in motion.

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1/8 in., 3/16 and 1/4 in.

ALWAYS IN STOCK FOR IMMEDIATE SHIPMENT

MADE EXCLUSIVELY FOR TUMBLING PURPOSES

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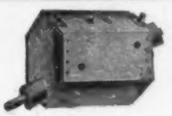

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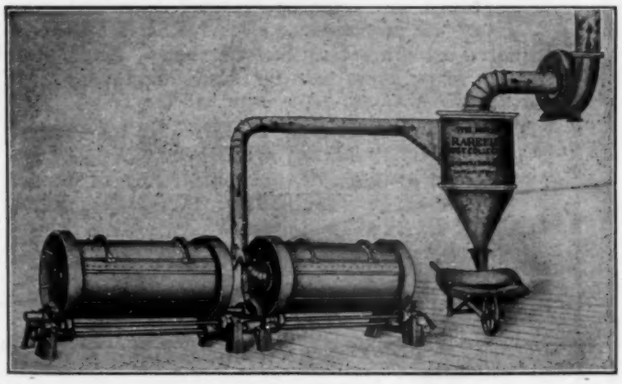

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NO CUTTING OUT OF FANS

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Sand Blast, Tumbling Mills, Emery Wheels

Shipment on 60 days' trial to any part of the United States

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SCALES, DIALS, ETC.

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Let us quote you for your etched plates.
We have the most modern plant. Best work. Lowest prices.

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They include washout, shoe handle, scouring, cotton potash, inside and end brushes, as well as Tampico wheel brushes.

Wires or bristles can't break or work loose. Write for prices.

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BROOMS, BRUSHES, AND FOUNDRY SUPPLIES
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BRUSHES

Brass, Copper and Steel Wire Brushes
An assortment of Machine and Circular Brushes.—
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Repairs Promptly Attended to.

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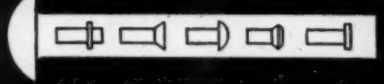

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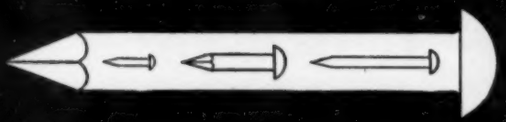

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Prices upon application.

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